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ORIGINAL COMMUNICATIONS.

ART. I. *On the Institution of Free-Masonry.* By GEORGE GODWIN, Jun. Esq., Architect, A.I.B.A.

(*Read at the Institute of British Architects, March* 14, 1836.)

" Hail to the craft! at whose serene command,
The gentle arts in glad obedience stand;
Hail sacred masonry! of source divine,
Unerring sov'reign of th' unerring line;
Who rears vast structures from the womb of Earth,
And gives imperial cities glorious birth!"

Anthem of the Craft.

THERE are few persons who have attentively examined the cathedral churches of Germany, France, and England, those gorgeous monuments of the daring ingenuity and persevering industry of man, but have enquired of themselves, in what state of civilisation was the great mass of the people, how far advanced were the sister sciences and arts, when these stupendous buildings, displaying the most delicate workmanship, the richest fancy, the most cultivated judgment, and the profoundest mathematical skill, were raised? The feathery fairy-like spires, towering into heaven, and seeming, so beautifully figurative, to connect therewith the dull earth; the slender and graceful columns holding up, as 't were in sport, the traceried roof; so easy, yet so confident; the problem which requires the *maximum* of strength with the *minimum* of materials, every where so admirably solved; all bespeak an advancement in civilisation equal, at the least, to that of which we boast, even at this period. How great, then, must be the astonishment of every enquirer when he finds that, at this very time, Ignorance, dark as Erebus, with Superstition, her eldest born, usurped the land; that few could even read; to be able to write entitled one to the appellation of scholar, and the knowledge of a few elementary principles in physics ofttimes proved but a passport to the stake.*

By what men then, by what *set* of men, differing so from their fellows, were these proud and indubitable evidences of superiority imagined and constructed? And by what strange chain of circumstances was the knowledge here displayed gained by, and confined to, them alone? A little farther enquiry shows

* Frederic Barbarossa could not read, nor could John, King of Bohemia (middle of the fourteenth century), nor Philip the Hardy, King of France. (*Hallam.*)

that these buildings were mostly executed by a heterogeneous band of men, Greeks, Italians, French, Flemings, and Germans, who were religiously bound to certain observances, kept up a peculiar system of discipline, and, possessing various protecting bulls from the church of Rome, maintained a perfect independence of the states in which they sojourned. This was the fraternity of Free and Master Masons: to their talents and industry, it need, then, hardly be said, architecture owes much; but, accustomed to regard them only in the light of a body of men associated for convivial and charitable purposes, we have long since ceased to connect them in any way with the original results of their combination; and it may not be uninteresting to lay before the lover of archæology a brief view of some points connected with their history and progress.

Were I to adopt the opinion set forth, and, with probability, sincerely entertained by some of the chroniclers of the craft, this account should commence with Ham, the second son of Noah; and should attempt to show that their first undertaking was the building of the Tower of Babel. The Israelites are by them proved to be a band of Free-Masons, having Moses for grand master; and the pyramids, with the other mighty works remaining in Egypt, are triumphantly pointed at as the results of their labours. Others, however, more modest, commence with the building of the Temple by Solomon, about 1012 years before Christ; and contend that Hiram, the widow's son, of the tribe of Napthali, was a master of the craft sent by Hiram, or Huram, King of Tyre, with other of his fellows, to assist Solomon in his tremendous undertaking. From what evidence such a conclusion was satisfactorily arrived at does not appear; but, finding this opinion is constantly and confidently repeated by the older writers upon the subject, we are compelled to suppose, either that they have all blindly followed a hastily made assertion, or that the fraternity themselves are in the possession of traditions or records inaccessible to the uninitiated: I am strongly inclined, however, to believe the former.

That in Egypt there was an associated body of men, to whom all scientific knowledge was confined, who preserved strict secrecy upon all matters connected with their ordinances, and used symbols familiar only to themselves, appears nearly as certain as that among the Greeks the initiated into the Eleusinian mysteries, so far as regarded their government and the lessons inculcated, also closely resembled the free-masons; but this is all that we know. At these last-mentioned and celebrated festivals, viz. those of Eleusis, the origin of which is attributed to Ceres, the neophyte about to be admitted underwent, as among the masons, an ordeal of no common severity; the principles of probity, charity, and humanity were impressed upon his mind, and the secrets of the mysteries were sworn by him to be held sacred. The tenets of the initiate we find, too, were not confined to Eleusis; for, about 1300 years before our era, says one (Laurie's *Hist. of Freemasonry*), they reached Athens, and, ultimately, France, and, probably, Britain; but in the records of this association we can discover no evidence of that which appears to have been the one great object of the fraternity of masons, namely, the study and practice of geometry and architecture; terms which, as they say, were with them synonymous, and comprehended the basis of all their proceedings. With the initiated of Eleusis it is hardly possible, therefore, to connect the free-masons; but, coming on to rather later times, we see that the disciples of the Dionysian mysteries, instituted in honour of Bacchus, to the due celebration of whose festival we owe the invention of theatres, were men intimately connected with science: they were termed the Dionysiac artificers; and, as a body, possessed the exclusive privilege of erecting temples and theatres in Asia Minor. These artificers were incorporated at Teos by the kings of Pergamus, where they built a magnificent temple to Bacchus; sufficient of which even yet remains to attest its grandeur, and to justify the terms in which Vitruvius speaks of its splendour. (See the Introduction to Wilkin's *Vitruvius*.) By them, also, it is supposed by some, the Doric and

Ionic orders were invented. They used symbols known only to themselves; at certain periods met for convivial purposes; and, according to some accounts, were actually divided into lodges, governed by chief officers; thus agreeing, in many respects, with the fraternity under notice; so much so, in fact, that even Robison, the most vigorous modern enemy that freemasonry has had, and who would not, therefore, yield to it a greater degree of antiquity than he felt himself compelled to concede, admits that in this association it had, at all events, its prototype. (See Chandler's *Travels in Asia Minor*, and Robison's *Proofs, &c.*)

Whether members of the same body or not, it is certain that, in later times, at Rome, the artificers were bound together in a somewhat similar manner; having colleges, or lodges, where they held their meetings, and studied the principles and practice of architecture: it does not, however, appear quite clear to me whether these colleges were part and parcel of a general body acknowledging one supreme head, or whether they were not independent associations of men organised for the study of their art; sometimes by the authority of the reigning emperor, and sometimes by private individuals. A passage from Pliny (as quoted by Dalloway), wherein he requests Trajan to establish a college of artificers (collegium fabrorum), in order to effect the rebuilding of Nicomedia, just then destroyed by fire, and in which passage no reference is made to any association actually existing of which this was to form a part, seems to express that such a proceeding was not uncommon, and to justify in some degree the doubt.

There is a passage in Gibbon which appears to me to bear a little upon the subject of associated artificers, and, perhaps, deserves mention. He says, when Probus commanded in Egypt, A. D. 280, he executed many considerable works for the splendour and benefit of that rich country. The navigation of the Nile, so important to Rome itself, was improved, and temples, bridges, porticoes, and palaces were constructed by the hands of the soldiers, who acted by turns as architects, engineers, and husbandmen." (*Decline and Fall, &c.*, vol. ii. p. 89.)

Rome fell! Torn by internal faction ,and enervated alike morally and physically by her very triumphs, the mother of many nations slowly succumbed to the barbarian hordes, innumerable, which the North, at that time, poured forth upon the world. All art was stagnated, frozen by their chill influence, and long and sad was the dark winter that then ensued.

When Constantine, at the commencement of the fourth century, removed the seat of empire to Byzantium, or Constantinople, as it was afterwards termed (the last blow which severed prosperity and Rome), he employed the whole energy of the nation to beautify and adorn his new city: 2,500,000*l.* were set apart by him for the construction of the walls, porticoes, and acqueducts; and, says Gibbon, "a multitude of labourers and artificers urged the conclusion of the work with incessant toil. The impatience of Constantine, however," he continues, "soon discovered that, in the decline of the arts, the skill as well as numbers of his architects bore a very unequal proportion to the greatness of his designs; and the authorities of the most distant provinces were therefore directed to institute schools, to appoint professors, and, by the hopes of rewards and privileges, to engage in the study and practice of architecture a sufficient number of ingenious youths, who had received a liberal education." This law is dated A. D. 334, and was addressed to the prefect of all Italy, whose jurisdiction extended even to Africa; so that its results, we may suppose, must have been great. Here, then, I conceive, we obtain a starting point, presenting fewer difficulties than any we have yet seen; and, without going into the question, as to whether the professors appointed to superintend and organise these colleges were not actually remnants of the more ancient associations previously mentioned, and who initiated the students into their own mysteries, thus accounting for the coincidences already pointed out, I am contented to believe that in the members of these we have the ancestors of that body of men more immediately under consideration, the

Free-Masons of the middle ages. In Constantinople, as is known, a vast change was effected in architecture. Unfettered by the restraints which, at Rome, paganism and want of space had put upon them, the Christian architects determined upon an entire change of forms in their religious edifices, and the cross of equal sides, surmounted at the junction by a majestic cupola borne on arches, became the most striking characteristic of their style. In Constantinople, as we know, the sciences flourished for some time, in a greater degree than elsewhere; her men of learning were sought by European as well as Asiatic nations, and her architecture was copied on all sides. Many of its characteristic features came even beyond the Alps, and were taken up by the Lombards; so much so, indeed, that Hope declares, that when, upon entering the ancient city of Cologne, he saw the east end of the Apostle's Church, he almost thought himself again at Constantinople. (*Hist. of Architecture.*) Its less details may be found in nearly all the various states of Italy.

Let us now turn for a brief space to England, where, according to the chroniclers, free-masons were early to be found. One writer has ventured the opinion that the Druids had a somewhat similar association, using like symbols, and practising architecture, into which they had been initiated by disciples of Pythagoras: and Preston, in his *Illustrations of Masonry* (though, it appears, from his enthusiasm on the subject, he might easily have been deceived himself, even if not desirous to deceive others), mentions an old MS., which said that St. Alban, who was beheaded A. D. 303, "loved masons well, and cherished them much;" and that he used his influence to obtain a charter from the king enabling them to hold an assembly. Of these and many other assertions, however, such as those regarding the foundation of the old cathedral of Canterbury by the craft in 600, that of Rochester in 602, and that of St. Peter, Westminster, in 605, &c., we have no proof; the authentic records, in most cases, having been destroyed. The time from which, as it appears to me, we can, with the greatest assurance, date the appearance of the free-masons in this country, is in the ninth century of the Christian era; although members of the Dionysiac and other mysteries, that came over to Britain with the various missionaries from Rome, may have been, nay, probably were, established here long previously; and notwithstanding Dr. Henry says (*Hist. of Great Brit.*, vol. iv.) that masonry was restored, and some other arts connected with it brought to England, towards the end of the seventh century by two clergymen, who were great travellers, and had often visited Rome, where they had acquired some taste for these arts. These were the famous Wilfred, Bishop of York, and afterwards of Hexham, and Benedict Biscop, founder of the Abbey of Weremouth. Biscop, it is certain, several times journeyed to Rome to persuade artificers to come to England; but I find nothing to identify these workmen with the fraternity under consideration.

Alfred, so truly termed the Great, among other admirable endeavours to ameliorate the condition of his people (endeavours which, had they been sufficiently advanced to cooperate with him, would have placed England a hundred years forward on her progress towards civilisation), strove to improve the domestic architecture of the country. At that time use was made of hardly anything for building but timber; a house of stone being regarded as a sort of wonder: Alfred, however, invited the most noted architects from foreign countries to repair to Britain, with workmen eminent in the arts, and raised his palaces of stone and brick; an example which, by degrees, was followed by the nobility. (Rapin's *Hist. of England.*) At the commencement of this same century, Charlemagne, in like manner, on the Continent, had summoned men of all nations to build his celebrated church at Aix la Chapelle; after which events the existence of the fraternity of free-masons, under that title, is no longer doubtful; and the results of that existence are seen in a multiplicity of splendid structures, erected with amazing rapidity, and displaying the origin, progress, and perfection of an entirely new and exquisite style of architecture, viz. the pointed. It is, most probably, from the strict secrecy under which all their proceedings were conducted, that so

much doubt exists respecting the first introduction of this style. It appears clear, however, that, although the pointed style appeared nearly simultaneously in Germany, France, and England, it is in the first of these three, viz. in Germany, that we must look for the earliest examples. This, however, is not a subject now to be entered upon. (See, on this head, Hope's *History of Architecture.*)

In the states of Lombardy, as we know, commerce, the offspring of industry, first gradually threw off the weight under which prosperity had been pressed to the earth by anarchy and barbarism since the overthrow of the Roman empire; and architecture and masonry, with the other sciences and arts, were again studied. This being the case, and the Lombardians, having before them the experience, and among them some of the descendants, of the modern Greek or Constantinopolitan school, which, as we have seen, had attained a certain degree of perfection under the fostering hand of Constantine and his successors, they soon became, as a natural consequence, not only the merchants of the world, but its builders; being eagerly sought for, when their own market was overstocked and they appeared disposed to travel in search of employment, by all the potentates of adjoining nations, who were at that time universally employed in raising religious edifices.

Wherever and whenever a missionary was despatched from the pope to preach the Christian doctrine (and these were every day departing), to that place speedily resorted a band of these wandering architects, under the special direction of the most expert craftsman among them, whom they denominated the *Master*, to raise a fitting temple to the Deity. So numerous, however, were the demands for their services, that their numbers were found to be inadequate to the purposes of religion; and the Church of Rome, which must fully have felt how important a part of its machinery they at that time were, saw that some measures were necessary in order to swell their ranks, and protect them in the undisturbed exercise of their duties. Bulls were accordingly issued endowing them with various rights and immunities: exemption was granted them from the laws of all local authorities; and those who opposed or interfered with their purpose were loudly threatened with excommunication. This proceeding speedily had the desired effect: Greek, Flemish, Italian, and German artists joined the main body, and were initiated into their mysteries; and, it is supposed, from this exemption from all local enactments, and the right to roam from place to place as they might feel inclined, or their interest lead them, they entitled themselves Free-Masons.

That the pope did really confer upon them these privileges has been questioned, and, perhaps, with some show of reason; for it appears that, upon searching the Vatican for the purpose of discovering the bulls stated to have been published, none were to be found: the many and clearly apparent reasons, however, which should have induced the pope so to do; the constant reiteration of the circumstance by the chroniclers of the craft; and the fact that they did so quietly and independently pursue their labours in various countries, and in no very settled times, strongly induce me to put confidence in the assertion. Again, too, we find it recorded in Dodsworth's *Account of Salisbury*, as quoted by Britton, that, even in later times (1244), the Archbishop of Canterbury granted an indulgence of forty days to such as aided the new and wonderful structure of the Church of Sarum; which, the proclamation went on to say, could not be completed with the same grandeur without the assistance of the faithful: a fact which affords, as it appears to me, a strong collateral evidence in favour of the generally received statement.

This quotation, too, may also serve in some degree to explain to us the means which were used, builders being now provided, to raise sufficient sums for the construction of those magnificent edifices, which, for want of like resources, and, I may almost say, for want of these alone, are now beyond our imitation.

The Church of Rome has ever perceived the more speedy influence that is to be gained over men by appealing to their senses than to their reason

and the continual use made in her rites of striking and mystic ceremonies (gazed upon with expectant fear, because, at that time, at all events, they were not understood), of the mind-bewildering incense, and of the exciting and awe-inspiring chaunts, now but softly murmuring as a breath, then pealing forth as 't were a whirlwind, and carrying with them the senses of the listening votaries, clearly shows how fully and how systematically she has acted upon this knowledge. A sublime and lofty structure, then, dimly though richly lighted through glass of many colours, by which was cast an artificial glow on the magnificent paintings, sculptured monuments, and gilded decorations, with which its interior teemed, was found to be no trifling adjunct in the process; and the whole power of the church was employed, as I have already said, in erecting such edifices, and inciting a spirit to "go and do likewise" throughout the world. Bulls were published dispensing with a portion of all penances for sin to those who contributed to raise a church: men were taught that Heaven's pardon could be purchased, that God could be bribed to wink at sin, by adequate donations to his church; and eloquent monks were despatched all over the world to inflame the ardour of the pious, and persuade or frighten, as the case might be, those who yet remained undecided.

Great indeed were the results; the land was as one workshop, and a man feared he had lived in vain had he not contributed to erect or adorn a religious house. (*William of Malmsbury.*) So profusely generous, indeed, were the grants made alike by prince, peer, and peasant, that it has been shown, to speak of England alone, that, at the death of Edward the Confessor, more than one third of all the land was in possession of the clergy; exempt from all taxes, and, for the most part, even from military service. (Henry's *Hist. of Great Britain.*)

The free-masons, as we have seen, were the instruments employed to effect these purposes of the church; and nobly they fulfilled their duty. Passing their earlier works in Lombardy and Germany, in which are to be discovered the germ of the pointed style and its first developement, I would just direct attention to the cathedrals of Strasburg, Friburg, Cologne, Antwerp, St. Ouen, in Normandy, and that *orbis miraculum*, as Leland calls it, Henry the Seventh's Chapel, in England. To mention all the works of the freemasons were to speak of nearly all the edifices constructed during several centuries of that period, and would fill a volume; but the above may serve for instances of their wondrous genius as designers, and of their mathematical skill as constructors; astonishing us alike by the boldness of the outline and the grandeur of the masses, as by the lightness of the parts and the elegance of the execution.

In England, although I do not find that any additional privileges were extended to them by special enactment, few buildings were erected during the twelfth and the three following centuries without the assistance of members of the craft: in fact, the requisite skill appears to the last to have been confined to them; and some idea may be formed of their numbers, when we see that, during the thirteenth century, no less than ten cathedrals were in progress simultaneously. (Dibdin's *Tour.*)

Having thus briefly spoken of the origin and object of the fraternity of free-masons, traced, in some degree, their progress, and mentioned the results of their labours, I shall next attempt to bring together some few points of information regarding their internal government. As a consequence naturally resulting from the mystery with which they enshrouded all their proceedings, the authorities on this head are very few; collecting and collating, however, all that can be found, it would appear that a regular system of science, handed down to them from early times, and added to by almost each possessor, was taught in their lodges; and that of this system geometry (considered by them the first and noblest of the sciences) was the basis. The strictest morality was inculcated at their meetings; and the ancient charges by which they were governed display an uprightness of conduct much to be admired. "Let no master," says one, "take on him no Lord's worke, nor any other man's,

unlesse he know himselfe well able to perform that worke, so that the craft have no slander;" a caution seen by no means to be disregarded, when we find in Dugdale and in Rymer the free-mason stipulating in his contracts, "to yield up hys body to prison at my Lord's wyll" in case of nonperformance. Another enjoins, not to supersede a brother mason, or to work for less than the established rate; and a third impresses the necessity of humility of behaviour and general kindness to all men.

When a band departed on an undertaking, a charge provided that the most expert craftsman should be appointed *Master of the Works*; under whom, when they reached their destination, every tenth man was appointed warden over his nine fellows; a camp near the spot was erected, and a lodge built in which to hold their meetings and regulate their prices; for, as we have already seen, no local enactments had control over them: here, also, the apprentices resorted at certain periods to hear discourses upon the sciences and lectures on morality; for at this period, I should have said, it is supposed that none could become a free and accepted mason without serving and studying under a master, as an apprentice, for seven years; during which time he was gradually initiated into the mysteries, and was ultimately accepted as a brother.

With respect to the mechanical aids employed by the fraternity, it has been supposed, from the fact that nearly all their buildings are constructed of small stones, that, although they possessed and understood the windlass and other contrivances, they never used them, each stone being taken up the ladder by a man. Some little time since, however, I met with an old picture, I think of the fourteenth century, in the University at Brussels, in which is represented a body of free-masons who are employed in erecting a church, and who are attacked by Lucifer and his fiends, with a view to prevent the consummation of their purpose; and here the men are seen employed in raising the stones to the top of the building by means of pulleys and windlasses, while others are moving the larger blocks with levers and rollers. The instruments used by the men who are mixing the mortar and raising it into a heap are precisely similar to those at present employed, as are the tools seen in the hands of the masons who are carving the ornamental portions.

From all that can be gathered, the free-masons appear to have worked with the most persevering industry, applying their whole energy and skill to the task in hand; and Wren, who, in after-times, was himself a master of the craft, says, "Those who have seen the accounts in records of the charge of some of our old cathedrals, near 400 years old, cannot but have a great esteem for their economy, and admire how soon they erected such lofty structures." (*Parentalia*, p. 306.) From various circumstances, many have supposed that the use of detailed drawings, for the guidance of the workman in the construction of a building, is of comparatively recent origin; or, at all events, that it was not common among the free-masons of the middle ages: the general design was described by him from whom the idea emanated; and the filling up, the nature of the ornaments, &c., were left, they have supposed, to the skill and caprice of the various artificers employed; whence, say they, the infinite variety to be found in their buildings. This, however, was not the case, as there are many documents remaining to attest. Even so early as the building of the Temple, we find David giving to Solomon, his son, *a pattern for the porch*, and others for the treasuries, the upper chambers, and inner parlours. (1 *Chronicles*, c. 28.) Carter, in his *Architecture of England*, says there is a basso relievo of high antiquity in the Cathedral of Worcester, in which is represented an architect presenting his plan, marked on a tablet, to the superior of a monastery; and we find in Henry VII.'s will, as quoted by Britton (*Architectural Antiquities*, vol. v.), that the Prior of St. Bartholomew is expressly called "master of the works," with reference to his chapel; and mention is made of the designs for images in picture delivered. To crown all, however, I have lately seen, among the archives at Darmstadt, the original drawing for that splendid promise, Cologne Cathedral, in which every orna-

ment, however minute, is scrupulously delineated to a scale. This drawing, which is 12 ft. or 14 ft. long, was discovered in a somewhat singular manner by the venerable and talented author of the *Memorials of German Gothic Architecture*, Hof-Bau-Director Moller; by whom, having first made a copy, it was deposited in the library of his patron the Duke of Darmstadt. That many similar documents have not been found is not because they have never existed, but that, from various causes, they have been since destroyed. The thick veil under which the free-masons have ever desired to conceal their proceedings has naturally led them, whenever attacks made by reigning authorities on the power of the craft induced them to fear an attempt to wrench from them their secrets, to destroy all documents in any way connected with their art; among which, of course, would be included the various details and calculations with regard to construction; the chief results of a knowledge so superior to that possessed by the general body, and as such, therefore, zealously guarded by them. These occasions, too, have not been seldom; for, although for some time, when their skill was most wanted, they were protected by the pope, met with encouragement on all sides, and were able to sing—

> "High honour to masons the craft daily brings;
> We're brothers of princes, and fellows of kings,"

the pressing need for their services gradually was lessened; the pope withdrew his countenance; and, as an associated body of men bound together by certain and secret ties, and acting, therefore, in concert, they were soon looked upon with suspicious eyes by the various despotic governors of the time; and were often persecuted with extreme rigour, under the pretence that their secret meetings were used to cover treachery. Even in the time of the Romans, Trajan, in answer to Pliny's epistle, already quoted, in which he advises him to establish a college of artificers, consisting only of 150 men, and assures him he will take care none but artificers are admitted, declines doing so, on the ground that the secrecy which attends their proceedings, and the consequent facility for plotting, would always render them dangerous.

In England the free-masons have been seldom interfered with by the authorities, except on account of their disregard for those ordinances which regulated the wages of labourers; holding themselves, as we have seen, perfectly independent on that head, on the presumed authority of the pope's bull: but we find, in consequence of this, that in the reign of Henry VI., although the king, four years afterwards, became a mason himself, a statute was passed, enacting, that persons calling or holding chapters should be declared felons; and all other masons assembling "*soient puniz par emprisonement de le corps, et facent fyn et raunceon à la volunté du roi.*" (Pownall's *Essay Archæologia*, vol. ix.) To go into this portion of their history, however (which does not immediately concern our purpose), would too widely extend the limits of a paper already, in length, exceeding my original intentions.

Masonry, in the sixteenth century, had passed its meridian, but continued to remain, the shadow of itself, until the end of the seventeenth; when, a proposition having passed that its privileges should no longer be confined to operative masons, but extend to men of all professions, it became immediately changed in its essential points, and is now hardly remembered other than as a convivial association. Here, then, must I conclude this present notice. There are, as it appears to me, few points in the history of the middle ages more pleasing to look back upon than the existence of the associated masons; they are the bright spot in the general darkness of that period; the patch of verdure where all around is barren: we see the demand for a particular skill instantly creating a plentiful supply; and watch the fraternity toiling on resolutely and successfully in the perfecting of that skill, just so long as the demand continued: it is, in fact, a subject so rife with matter for instructive contemplation, so full of important lessons, that no one can sit down to its investigation without advantage. In studying the works of the free-masons, they

become additionally interesting if we have a knowledge of the men; and the men, in like manner, are invested with greater importance when we reflect upon their wonderful productions.

I need give no other reason for calling attention to the Free-Masons.

ART. II. *Remarks on the unsuccessful Designs for the new Houses of Parliament, now exhibiting in the National Gallery, Charing Cross.* By B.

[We have purposely deferred any further remarks of our own on this exhibition, partly in the hope of seeing the successful designs, but principally because, agreeably to our suggestion (p. 189.), a catalogue of the designs is about to be published, in which each architect will explain his own design. We shall then be enabled to test each design by the intentions of its author. In the mean time, we publish the following observations, which have been sent to us by a correspondent.]

THE exhibition of the rejected designs for the new Houses of Parliament has now been opened for some time; and the public have had an opportunity of judging from it of the architectural talent in the country. Among the seventy-eight exhibitors, a great deal of architectural and antiquarian knowledge has been shown; and, when we consider that these are but a very small portion of the profession, and that among them there are many tyros, I think the exhibition argues that there is more talent in the country than was generally supposed. The reason why the competitors were not more numerous must be obvious to every one: this competition has, possibly, been fair; but the manner in which many previous competitions have been decided was quite sufficient to deter many talented men from entering this.

Upon taking a general view of the designs, the prevailing fault found in most of them is want of fitness; that is, they are almost all too ecclesiastical in their character. It will be said, probably, in answer to this, that cathedrals are the only Gothic examples that architects have to study, as there are no ancient senate houses: so much the better, I should say, since, having no buildings to copy from, you will be forced to think; and it is then probable that you will invent something new. Where will you find ancient examples for the customs, comforts, and improvements of modern times? Are we not to have also improvements in our architecture; or is it out of the power of architects to invent? Is architecture incapable of improvement? Did the freemasons of the sixteenth century show that they could not alter, and make a distinct style from the architecture of the fifteenth century? They did alter, and adapt ancient architecture to the wants of their times; and yet they preserved the same character.

As customs altered, so did architecture; but the acme of architecture of the present day appears to be considered as a perfect copy of some well-known beautiful edifice; if not in its general form, always in the details. If the freemasons had thought in this way, where should we have found the elegance and grandeur of a York Cathedral, the airy loftiness of a Salisbury spire, or the web-like tracery of a Henry the Seventh's Chapel? Is it beyond human power to produce some new system of architecture? Surely not. Preserve all your ancient buildings; store them up as words belonging to the language of your art; but use these words only to compose new sentences; and do not reproduce those already known; for, if you do, what will posterity say of you? That you could copy well in the nineteenth century, but you could not invent.

Britton's *Antiquities of Great Britain* appears to have been ransacked for precedents by the competing architects; and in almost every design we find

fragments from all the well-known cathedrals; arranged with a great deal of antiquarian precision, but with very little originality, and some indifferent grouping. In most of the designs, a deficiency of grouping, and a want of unity and expression are the faults. Spires I should expect in a cathedral, but hardly in a senate house. It is exceedingly difficult to say which design possesses most merit: all should be looked at; but, among those deserving most notice, are the following, which I enumerate, premising that I speak merely of the exterior at present; and, when the promised catalogues are out, it will be much easier to form an opinion of the plans. The design of Burrel and Lugar is very showy, and groups pretty well; but it is rather too much fretted away, and it wants repose. I think, in execution, the details would be deficient. Mr. Cockerell's design has some beauties in it; and, in the perspective, the design is greatly indebted to two immense domes for its unity: take these away, and what is the design? It is a pity that the Elizabethan character is not properly established by architects. Look at Mr. Cockerell's, Mr. James Hakewill's, and Mr. Salvin's Elizabethan designs, as they are all called, and see the wide difference between them. Perhaps Mr. Cockerell's is nearest to the style; the other two gentlemen being at the opposite extremes. Mr. Hakewill's design is extremely poor; and, though Mr. Salvin's possesses a good deal of originality, and some grandeur, it would look infinitely better as a state prison or an hospital, than as a senate house: there are some picturesque parts about it, and it is a style that would suit a moderate-sized dwelling, but hardly a public building, and more especially one like that in question. Mr. Cockerell's design is also characterised by a clock tower. [This clock tower is in imitation of that which was erected and "furnished with a clock in the reign of Edward I. See Britton and Brayley's *History, &c., of the late Houses of Parliament:* an excellent and interesting work, the concluding number of which was published April 1.] In Mr. Cottingham's designs the buildings are scattered about in such a way, that you can get no pleasing view of them; but, by the help of a little manœuvre, he makes one good group in his design. A spire is placed on Westminster Abbey, and it just comes in the centre of the Speaker's house, at that particular point which the view is taken from; but move a little to the right or left, and the charm is gone. Certainly, it would be an additional beauty to the Abbey; but why take Salisbury spire as a model. This design is overpowered with gigantic buttresses and pinnacles; and there is little in it to satisfy the general observer, except that it covers a large portion of the wall of the exhibition room. Mr. Cottingham has given his idea as to the restoration of St. Stephen's Chapel; and it is amusing to see the different ideas on this subject, no two being alike: and, when it is restored, will it be in its pristine form? It must be entirely rebuilt from the crypt; and is it desirable? Would it not be better to preserve the ancient fragments in the entrance court of the British Museum; they would there be useful?

Mr. Donaldson's design possesses many of the requisites in architecture, and the unity is preserved; but still I do not admire the spire in this composition; his houses on each side are, also, too much like chapels, and their connexion with the sides, I think, is not quite in harmony.

In Mr. Ferrey's design there is an elaborate confusion pervading the whole composition; but still, like most of the designs, it possesses many beautiful parts. Mr. Graham's design is quite divided into two parts, the only connexion being a long gallery; so that it appears to be two distinct buildings. Mr. Hopper has collected all the pinnacles he could of the fourteenth century, and placed them at the top of his building, like a park fence.

In the design of Messrs. Kendall and Hopkins there is much to please the general observer; but it would require very great modification before it could be executed. The pinnacles and caps are gigantic. There is a good deal of originality in parts of the design, and something of what might be called poetic feeling. Mr. Pennethorne's might be mistaken for a large foreign cathedral. Mr. Robinson's design requires expression: there are many beauties in it; but

it is not good as a whole: it is a combination of cottages. Mr. Wallace will come in for a share of commendation for parts of his design; Mr. Lamb, for unity of expression [and, we may add, for correct drawing, and general good arrangement]; and Mr. Bardwell, for some good parts. In most of the designs, indeed, there are some beauties; and the comparisons which the exhibition affords will give the public an idea of judging of the merits of architectural composition. In this elaborate subject, with the many difficulties the architects must have had to contend with, and the little encouragement they expected from the general manner of deciding these competitions, the exhibitors have shown a great deal of perseverance in completing so many meritorious designs; and a knowledge of the architecture of the country, that will always be an honourable reflection to most of them.

London, April 6. 1836.

ART. III. *Improvements and Contrivances.* By W. H. L.

ALTHOUGH W. S. has not distinctly stated such to be the case, it may be presumed the windows he mentions (p. 168.) have double sashes, the space between the two being occupied by plants and flowers in pots; but then, unless the inner sash be flush with the inner face of the wall, or else the wall itself exceedingly thick, the two sashes could hardly be so wide apart as to admit of a range of flower-pots, much less of plants growing between them. If, again, the inner sash is fixed according to the mode I conjecture, so as to form a glazed door, enclosing the window, there can be no shutters; and, although curtains alone might be deemed sufficient, still, hanging, as they must do, immediately against the glass, when drawn before the window, the latter, I should think, would be liable to be frequently broken, owing to strangers not being aware that there was a surface of glass in immediate contact with the drapery. Two other circumstances as to which W. S. leaves the reader in doubt are, whether the windows come down to the floor of the room, or not; and whether the external sashes are entirely filled with ground glass, or only to such a height as suffices to exclude the view of unsightly objects: neither of them is of any moment, otherwise than as regards effect; for, if the plants are raised above the floor, the recesses would not have much the character of small conservatories; besides which, they would darken the room; so, also, on the other hand, if the windows are entirely filled with ground glass, the light would be hardly sufficient for a sitting-room.

The contrivance recommended by W. S. could be put into practice, without the inconveniences apparently attending it, by affixing to the lower half of a window a frame glazed with ground glass, and two or three feet in depth; for, as external appearance would, in such cases, be of no consequence, it would be of no matter were the frame to project considerably beyond the face of the external wall, care, of course, being taken that its

bottom be supported like that of a balcony; and, in fact, such external recess would be an enclosed projecting balcony. Nay, it would, perhaps, be still better to form a veranda at once, glazed with ground glass to such a height as would shut out the view of all objectionable objects; leaving the upper part quite open for the admission of air, but yet glazing the roof of the veranda, in order to obstruct the light into the room as little as possible.

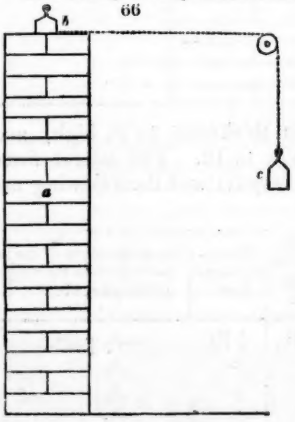
Various improvements on the same scheme will, doubtless, suggest themselves to others; and, therefore, W. S. deserves our thanks for having communicated it. In all probability, there are many ingenious and clever contrivances, which, having been adopted only on individual occasions, are very little known, although some of them might be worth bringing into general use. Information respecting matters of this sort would be highly desirable in such a publication as the *Architectural Magazine*; since, for want of being recorded in print, the things themselves are liable to be forgotten; and it may be here observed, *en passant*, that nothing answering to the term "contrivances" is touched upon in books on architecture; consequently, we are left to collect such particulars according as either chance may bring them to our notice, or enquiry direct us to them.

By way of setting a good example, and furnishing some slight contribution of the kind myself, I will here describe a very pleasing and well-imagined effect I have witnessed myself. A friend of mine, wanting to admit light into a narrow passage through a door at one end of it, had an aperture made in the door, which he filled with a plate of glass, and surrounded with a gilt picture-frame. Facing this aperture, and at about 3 ft. from it, he hung a large water-colour drawing, upon which the light was thrown immediately from above, through a small panel skylight in the ceiling. Thus, as the edges of the drawing (it being so much larger than the glazed aperture) could not be discerned till a person nearly reached the door, the frame seemed to contain a very brilliant self-illumined picture, of which the eye took in more and more as it came closer to it. To produce such effect, it should be observed that some peculiarity of situation is requisite, since the light ought to strike directly on the picture from above; or if from the side, it must be equally close to it: and the picture, again, must not only be opposite, but at a very short distance behind the door; unless, indeed, the painting should be of such dimensions that, though hanging on the opposite side of the inner room, it would seem completely to fill up the glazed aperture. In order, therefore, that it may be understood how this is managed in the instance here referred to, it should be stated, that the door from the passage leads into a recess about 3 ft. square, one side of which is open to a small anteroom, partly lighted from

the recess itself; and the picture hangs on that side of the recess which faces the door. It is hardly necessary to observe, that the latter is made to open outwards, and not into the recess. The anteroom itself exhibits, also, a good deal of contrivance in regard to uniting a pleasing degree of tasteful display with very little cost. The walls are shelved to about 6½ ft. high, for books; and above the cornice of this shelving is placed a series of plaster busts. At each angle of the room there is, also, a small whole-length plaster figure, standing on a pedestal formed by a mere deal framing covered with crimson cloth, and finished below with base mouldings painted white. On the front of each pedestal is an olive wreath in chiaroscuro, on paper, cut out and pasted on the cloth. The cornice of the room is a mere narrow moulding; but there is a broad architectural border on the ceiling, executed in the same manner as the paper for hanging rooms; and the ceiling itself is slightly tinted of a reddish hue. The floor is covered with India matting, bordered by two edgings of crimson cloth, put about 18 in. apart. The furniture consists of only two light chairs with crimson cloth cushions, standing next a table in the centre of the room; and the last-mentioned piece of furniture has a table-cover which, in its pattern and colour, is in the style of a rich Indian carpet. The *ensemble* is as striking as it is pleasing; and, perhaps, all the more so, because produced by such apparently inadequate means, and at a cost comparatively trifling.

London, April 16. 1836.

ART. IV. *Experimental Essays on the Principles of Construction in Arches, Piers, Buttresses, &c.* By WILLIAM BLAND, Esq. Essay III. *Of the Laws relative to Piers and Buttresses.*



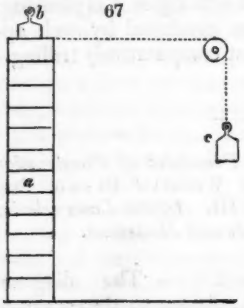
FIRSTLY. — The diagram *fig.* 66., drawn to the scale of one eighth of an inch to an inch, represents a pier (*a*), which is composed of wooden bricks, eight of which weigh 1 lb. This pier has a weight (*b*) on the top; and a string, pulley, and weight (*c*) at the end, to measure the lateral or horizontal force up to the balancing point. The following are the results of the first experiment: —

Height of the pier.	Dimensions of the pier.	Weight of the pier.	Weight on the top of the pier.	Balancing lateral force.	The proportion of the lateral force to the weight of the pier, and the weight placed on the top of it.
18 in.	4 in. by 4 in.	$4\frac{1}{2}$ lb.	1 lb.	$\frac{1}{4}$ lb.	$\frac{1}{22}$ part.
18	4 ... 4	$4\frac{1}{2}$	2	$\frac{5}{16}$	$\frac{1}{21}$
18	4 ... 4	$4\frac{1}{2}$	4	$\frac{3}{8}$	$\frac{1}{22}$
18	4 ... 4	$4\frac{1}{2}$	8	$\frac{7}{16}$	$\frac{1}{28}$

On reducing the height of the pier three courses of bricks at a time, and with a weight of only 1 lb. placed on the top of it, the results of the lateral forces were as follows: —

Height of the pier.	Dimensions of the pier.	Weight of the pier.	Weight on the top of the pier.	Balancing lateral force.	The proportion of the lateral force to the weight of the pier, and the weight placed on the top of it.
15 in.	4 in. by 4 in.	$3\frac{5}{4}$ lb.	1 lb.	$\frac{5}{16}$ lb.	$\frac{1}{15}$ part.
12	4 ... 4	3	1	$\frac{3}{8}$	$\frac{1}{11}$
9	4 ... 4	$2\frac{1}{4}$	1	$\frac{1}{2}$	$\frac{1}{6}$
6	4 ... 4	$1\frac{1}{2}$	1	$\frac{7}{16}$	$\frac{1}{4}$

67



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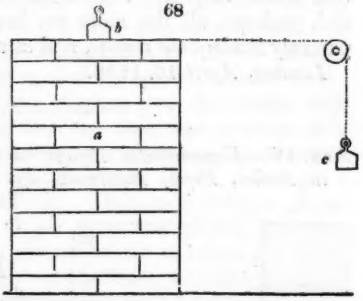


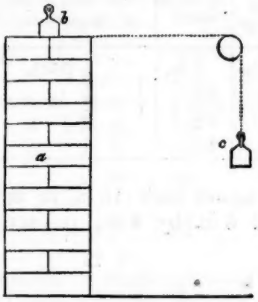
The pier *a*, *fig.* 67., is 2 in. in thickness, 12 in. high, and it was increased in length from 6 in. to 12. The lateral force was applied at right angles to the length; and the following are the results: —

Height of the pier.	Dimensions of the pier.	Weight of the pier.	Weight on the top of the pier.	Balancing lateral force.	The proportions of the lateral force to the weight of the pier, &c.
12 in.	2 in. by 6 in.	$2\frac{1}{4}$ lb.	1 lb.	$\frac{1}{8}$ lb.	$\frac{1}{26}$ part.
12	2 ... 8	3	1	$\frac{1}{8}$	$\frac{1}{32}$
12	2 ... 10	$3\frac{5}{4}$	1	$\frac{1}{8}$	$\frac{1}{38}$
12	2 ... 12	$3\frac{1}{2}$	1	$\frac{3}{16}$	$\frac{1}{19}$

The pier *a*, *fig.* 68., is 2 in. in thickness; the length increases from 4 in. to 8 in., the height continuing the same as in the last figure; but the lateral force is applied in the direction of the length, and the results are as follow: —

Height of the pier.	Dimensions of the pier.	Weight of the pier.	Weight on the top of the pier.	Balancing lateral force.	The proportion of the lateral force to the weight of the pier, &c.
12 in.	4 in. by 2 in.	$1\frac{1}{2}$ lb.	1 lb.	$\frac{5}{16}$ lb.	$\frac{1}{8}$ part.
12	6 ... 2	$2\frac{1}{4}$	1	$\frac{9}{16}$	$\frac{1}{6}$ nearly.
12	8 ... 2	3	1	$1\frac{1}{16}$	$\frac{1}{4}$

69



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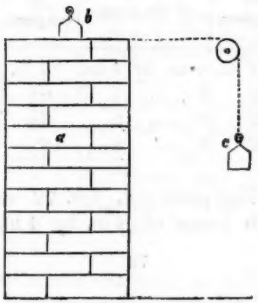
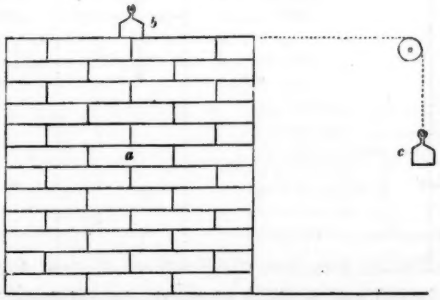


The piers, *figs.* 69, 70, and 71., are of equal height, and contain the same quantity of materials; because the respective dimensions of each, when multiplied into each other, give the

71



same result. The lateral force, however, is applied differently to each; the base of the pier *a*, *fig.* 69., being 4 in. to oppose the force; that of *a*, *fig.* 70., being 6 in.; and that of *a*, *fig.* 71., being 12 in. The results are as follows: —

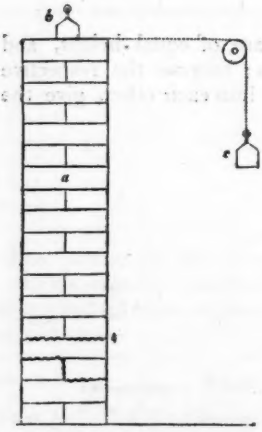
Height of the different piers.	Dimensions of the piers.	Weight of the piers.	Weight on the top of the piers.	Balancing lateral force.	The proportions of the lateral force to the weight of the pier, &c.
fig. 68. 12 in.	4 in. by 6 in.	$4\frac{1}{2}$ lb.	4 lb.	$1\frac{1}{3}$ lb.	$\frac{1}{7}$
fig. 69. 12	6 ... 4	$4\frac{1}{2}$	4	$1\frac{1}{2}$	$\frac{1}{6}$
fig. 70. 12	12 ... 2	$4\frac{1}{2}$	4	3	$\frac{1}{3}$

Piers with square bases, of the same height as the last three figures, but of different dimensions, have the following results: —

Height of the piers.	Dimensions of the piers.	Weight of the piers.	Weight on the top of the piers.	Balancing lateral force.	The proportion of the lateral force to the weight of the piers, &c.
12 in.	4 in. by 4 in.	3 lb.	4 lb.	$\frac{7}{8}$ lb.	$\frac{1}{8}$ part.
12	6 ... 6	$6\frac{3}{4}$	4	$1\frac{3}{4}$	$\frac{1}{6}$
12	6 ... 6	$6\frac{3}{4}$	8	$2\frac{5}{8}$	$\frac{1}{6}$
12	8 ... 8	12	8	$4\frac{1}{8}$	$\frac{1}{3}$

The piers *a a*, *figs.* 72. and 73., are both 18 in. in height, with bases of 4 in. by 4 in., and 6 in. by 4 in., respectively.

72



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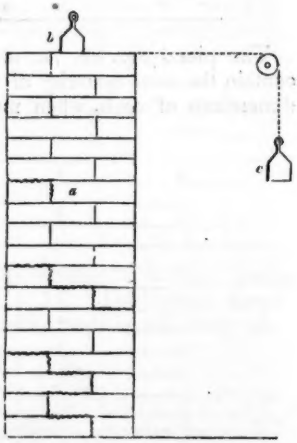


They are introduced to show where the lateral force breaks, or causes the piers to open, under different weights placed on their top. The following are the results of the experiments: — First, on *fig.* 72.

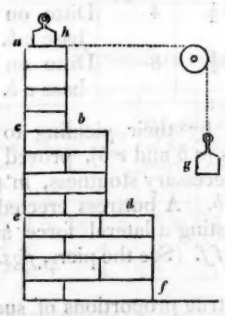
Height of the pier.	Dimensions of the pier.	Weight of the pier.	Weight on the top of the pier.	Overturning lateral force.	Number of courses above the base where the pier opens before falling.
18 in.	4 in. by 4 in.	$4\frac{1}{2}$ lb.	$\frac{1}{4}$ lb.	$\frac{1}{4}$ lb.	3 courses above the base.
18	4 ... 4	$4\frac{1}{2}$	1	$\frac{5}{16}$	$2\frac{1}{2}$
18	4 ... 4	$4\frac{1}{2}$	2	$\frac{6}{16}$	$2\frac{1}{2}$
18	4 ... 4	$4\frac{1}{2}$	4	$\frac{7}{16}$	$2\frac{1}{2}$
18	4 ... 4	$4\frac{1}{2}$	8	$\frac{1}{2}$	$2\frac{1}{2}$

Result of Experiments with *fig.* 73.

Height of the pier.	Dimensions of the pier.	Weight of the pier.	Weight on the top of the pier.	Overturning lateral force.	Number of courses above the base where the pier opens before falling.
18 in.	6 in. by 4 in.	$6\frac{3}{4}$ lb.	$\frac{1}{2}$ lb.	$\frac{11}{16}$ lb.	12th & 8th courses.
18	6 ... 4	$6\frac{3}{4}$	1	$\frac{11}{16}$	12th on $2\frac{1}{2}$ courses.
18	6 ... 4	$6\frac{3}{4}$	2	$\frac{13}{16}$	12th ... $2\frac{1}{2}$
18	6 ... 4	$6\frac{3}{4}$	4	$1\frac{1}{8}$	4 courses, and diagonally to base.
18	6 ... 4	$6\frac{3}{4}$	8	$1\frac{1}{2}$	4 ditto, ditto.

Secondly, of Buttresses. — The bricks are the same as in the seven preceding figures, and the diagrams are on the same scale.

74



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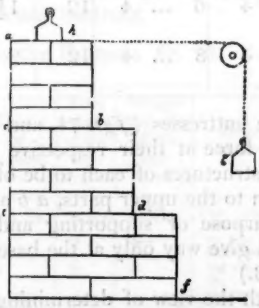


Let *figs.* 74. and 75. be two buttresses, and the following are their dimensions, and the results of the lateral force acting upon them.

It will be observed, that the results of the experiments on both *figs.*, 74. and 75., are the same.

Relative to *fig.* 74.

Piers composing buttresses.	Height of piers.	Dimensions of the piers.	Total height of the buttresses.	Weight of the piers.	Total weight of the buttresses.	Weight on the top of the buttresses.	Results and observations.
a b	4 in.	2 in. by 4 in.	12 in.	½ lb.	3 lb.	2 lb.	Lateral force causes the buttresses to give way on *c b*.
c d	4	4 ... 4	12	1	3	4	Ditto on the base *c b*.
e f	4	6 ... 4	12	1½	3	8	Ditto on the base *c b*.

Relative to *fig.* 75.

Piers composing buttresses.	Height of piers.	Dimensions of the piers.	Total height of the buttresses.	Weight of the piers.	Total weight of the buttresses.	Weight on the top of the buttresses.	Results and observations.
a b	4 in.	4 in. by 4 in.	12 in.	1 lb.	4½ lb.	2 lb.	Lateral force causes the buttress to give way on *c b*.
c d	4	6 ... 4	12	1½	4½	4	Ditto on the base *c b*.
e f	4	8 ... 4	12	2	4½	8	Ditto on the base *c b*.

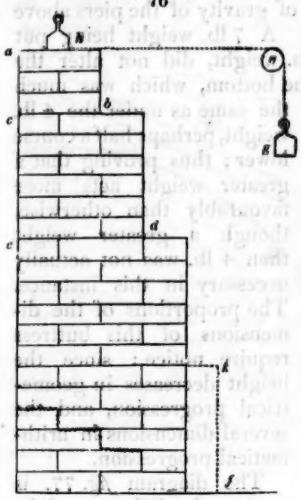
The buttresses (*figs.* 74. and 75.), by their yielding to the lateral force at their respective bases (*c b* and *c b*), proved the lower structures of each to be of unnecessary stoutness, in proportion to the upper parts, *a b* and *a b*. A buttress erected for the purpose of supporting and resisting a lateral force at *a*, should give way only at the base line *f f*. (See the piers, *figs.* 72. and 73.)

With the view of determining the true proportions of such a buttress, a pier was constructed, having it base 8 in. by 4 in., and raised to the height of 12 in., or twelve courses. This pier was submitted to the test of the lateral force, and yielded under the weight of 2½ lb.: a 4 lb. weight was previously placed on the top, and in the centre of the pier; a 1 lb. and a 2 lb. weight having been found too light to prevent the top courses from slip-

ping off under the lateral force. The pier gave way at the base, and diagonally towards it.

Another pier was next constructed, measuring 6 in. by 4 in. at the base, and raised indefinitely to the height of eight or ten courses, or inches, and a 4 lb. weight placed on the top. This pier being also submitted to the lateral force, as in the previous experiment, required the courses to be taken down to the sixth from the base before it would just balance, as the first had done, under the $2\frac{1}{2}$ lb. lateral force.

76



A third pier was then built up, having a base 4 in. by 4 in.; and, when raised three courses in height, with the 4 lb. weight on the top, it also just balanced against the lateral force of $2\frac{1}{2}$ lb., the same as the two former piers.

These three piers were placed one upon the other, as represented in the diagram *fig.* 76., by *e f*, *c d*, and *a b*, with the 4 lb. weight on the top. When this compound pier, or buttress, was submitted to the test of the lateral force applied at *a*, the whole, or the buttress, balanced against $2\frac{1}{16}$ lb., giving way diagonally on the base line *f g*, as was required of a true proportioned buttress.

Particulars relative to the Buttress *fig.* 76.

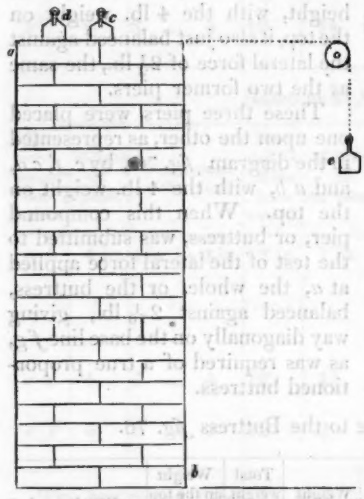
Piers composing the buttress.	Dimensions of the piers.	Height of the piers.	Total height of the buttress.	Weight of the piers.	Total weight of the buttress.	Weight on the top of the buttress.	Results and observations.
a b	4 in. by 4 in.	3 in.	21 in.	$\frac{3}{4}$ lb.	9 lb.	4 lb.	The lateral force caused the buttress to give way on the base line *g f*, breaking diagonally from the fourth course to the base.
c d	6 ... 4	6	21	$2\frac{1}{4}$	9	4	
e f	8 ... 4	12	21	6	9	4	

The total weight of the buttress *fig.* 76., including the weight on the top, equalled 13 lb.; and the lateral overturning force equalled $2\frac{1}{16}$ lb., or one sixth the weight of the buttress and the weight placed on the top of it. The increased height, or length of lever, formed by one pier being placed upon another, and these two upon a third, was considerably counteracted

by their respective weights acting towards the same outside, instead of being in the middle: but more of this presently.

On the top of the buttress *fig.* 76. a 2 lb. weight was substituted for the 4 lb. weight; and then the whole was submitted to the lateral force of $2\frac{1}{2}$ lb. The result was, that the buttress gave way on the top of the pier *e f*; thus proving the 2 lb. weight too light. Under the 4 lb. weight the buttress first gave way on the base *g f*, and next on the base *e d*, in consequence of the inclination which caused the centre of gravity of the piers above to act, or fall without the base *e d*. A 7 lb. weight being put on the top, in the place of the 4 lb. weight, did not alter the breaking of the buttress towards the bottom, which was much the same as under the 4 lb. weight, perhaps half a course lower; thus proving that a greater weight acts more favourably than otherwise, though a greater weight than 4 lb. was not actually necessary in this instance. The proportions of the dimensions of this buttress require notice: since the height decreases in geometrical progression, and the several dimensions in arithmetical progression.

77



The diagram *fig.* 77. is to show the difference of the effects of the same weight being placed on the top, in the middle, or towards the farther side from the lateral force. This pier is of the same height as the buttress *fig.* 76., and of equal dimensions at the base. The following are the results: —

Pier.	Dimensions of the pier.	Height of the pier.	Weight of the pier.	Weight on the top of the pier.	Balancing lateral force.	Conditions.
a b	8 in. by 4 in.	21 in.	$10\frac{1}{2}$ lb.	4 lb.	$1\frac{5}{8}$ lb.	With the weight in the middle at *c*.
a b	8 ... 4	21	$10\frac{1}{2}$	4	$2\frac{1}{16}$	Ditto at the outside at *d*.

The buttress *fig.* 76. and the pier *fig.* 77. agree precisely,

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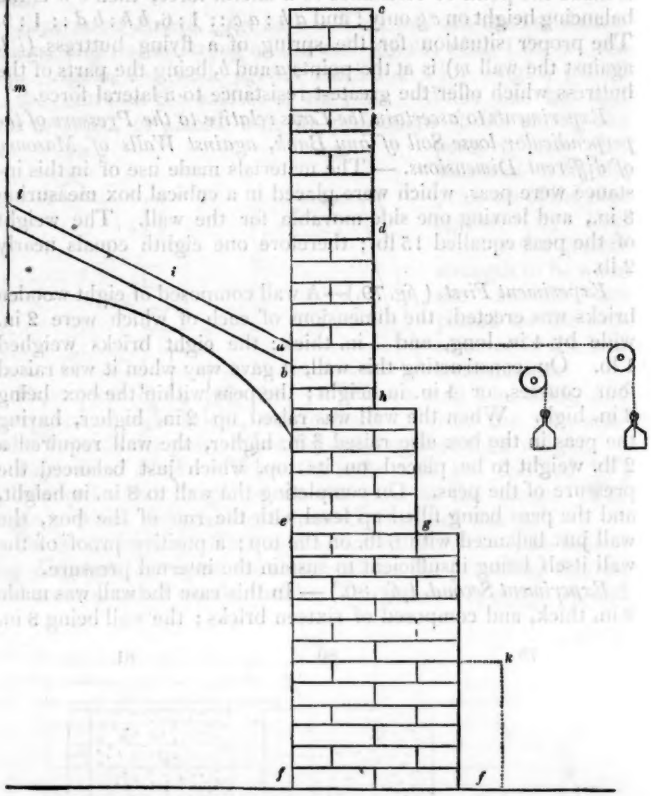


as it regards requiring the same lateral force, when the weight on the pier is placed at *d*; thus proving that a buttress of the construction of *fig.* 76. is as strong as this pier *fig.* 77., which is composed of less material by $1\frac{1}{2}$ lb. in weight, or in the proportion of nearly one tenth part.

To return to the buttress *fig.* 76.: since this buttress appears to answer the purpose intended, it will not be amiss to delineate its parts more fully, by introducing another diagram, in which bricks will be substituted for the 4 lb. weight on the top, and thus complete the buttress. A few observations will necessarily follow:—

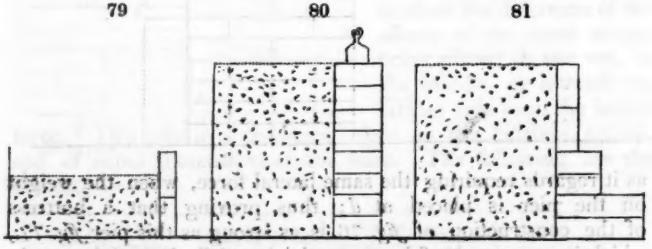
Fig. 78. represents the buttress *fig.* 76. completed; in which

a is the point of resistance, as in *fig.* 76.; *a c* is the balancing height on *f f*, and is equal in weight to 4 lb. When *b* is made the point of resistance to a lateral force, then *b d* is the balancing height on *e g* only; and *a h* : *a c* :: 1 : 6, *b h* : *b d* :: 1 : 3. The proper situation for the spring of a flying buttress (*i l*, against the wall *m*) is at the points *a* and *b*, being the parts of the buttress which offer the greatest resistance to a lateral force.

Experiments to ascertain the Laws relative to the Pressure of the perpendicular loose Soil of any Bank, against Walls of Masonry of different Dimensions. — The materials made use of in this instance were peas, which were placed in a cubical box measuring 8 in., and leaving one side movable for the wall. The weight of the peas equalled 15 lb.; therefore one eighth equals nearly 2 lb.

Experiment First. (*fig.* 79.)—A wall composed of eight wooden bricks was erected, the dimensions of each of which were 2 in. wide by 4 in. long, and 1 in. thick; the eight bricks weighed 1 lb. On constructing this wall, it gave way when it was raised four courses, or 4 in. in height; the peas within the box being 3 in. high. When the wall was raised up 2 in. higher, having the peas in the box also raised $\frac{2}{3}$ in. higher, the wall required a 2 lb. weight to be placed on its top, which just balanced the pressure of the peas. On completing the wall to 8 in. in height, and the peas being filled up level with the rim of the box, the wall just balanced with 6 lb. on the top; a positive proof of the wall itself being insufficient to sustain the internal pressure.

Experiment Second. (*fig.* 80.) — In this case the wall was made 2 in. thick, and composed of sixteen bricks; the wall being 8 in.



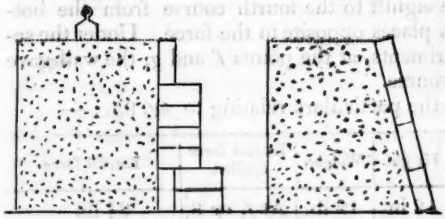
high, and its weight equalling 2 lb. The peas within were level with the top of the box; and their weight, as before stated, equalled 15 lb. This height and weight of peas caused the above wall to give way; but, on putting a 1 lb. weight on the top, it just balanced against the pressure of the peas.

From these two experiments it appears, that, by doubling the thickness of a wall, less than half the weight is sufficient to maintain the outward pressure of the bank within.

Experiment Third. (*fig.* 81.) — This wall consisted of sixteen bricks, and just balanced against the pressure of the full box of peas.

Experiment Fourth. (*fig.* 82.) — This wall consisted of sixteen bricks, and was as strong as the wall *fig.* 81. with 1 lb. on the top. Again, the wall *fig.* 82. carried a 4 lb. weight, placed in the centre on the surface of the peas. When this last wall was reversed, or placed with its projections inside among the peas, it only just balanced with the pressure of the peas against it; thus proving the greater strength to be when the set-offs are placed on the outside, or in the buttress manner.

82 83



Experiment Fifth. (*fig.* 83.) — When a wall 1 in. thick, and composed of eight bricks, was inclined 15° from the perpendicular towards the peas, it just balanced against their weight.

Experiment Sixth. — When the same wall was inclined 23°, it balanced with 2 lb. placed on the peas in the centre. The angle at which the peas stood naturally inclined was 36°.

On the Strength of Walls against lateral Force. — The following diagrams are upon the same scale as the preceding figures, and constructed of wooden bricks. The letters *a b*, in *figs.* 84. and

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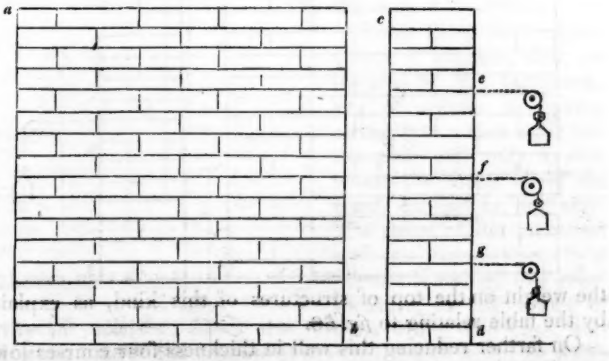

85. respectively, represent the front elevation; and *c d*, in both figures, the side view, or section, of the walls. The following are the results relating to *fig.* 84.: —

Wall.	Dimensions.	Height.	Weight.	Points where the lateral force was applied.	Lateral force.
a b	16 in. by 4 in.	16 in.	16 lb.	At *e*.	$1\frac{1}{16}$ lb.
a b	16 ... 4	16	16	*f*	$2\frac{7}{8}$
a b	16 ... 4	16	16	*g*	6

Under the first experiment, at the point *e*, the wall gave way, diagonally, from the eighth to the fourth course from the bottom, opening at both places opposite to the force. Under the second and third experiments, at the points *f* and *g*, the wall gave way on the bottom course.

The following are the particulars relating to *fig.* 85. : —

Wall.	Dimensions.	Height.	Weight.	Lateral force applied.	Lateral force.
e d	16 in. by 4 in.	12 in.	12 lb.	At *f*, or 8	$2\frac{7}{8}$ lb.
d c	16 ... 2	4	2	courses up.	$2\frac{7}{8}$

It appears from the above table, on comparing the lateral force with that in the table relating to *fig.* 84., that, when the force is applied at the same height from the base, the resistance is equal in both instances, although the four top courses in *fig.* 85. have been reduced to half the weight of the same number in *fig.* 84. This has been before shown to be the case on lightening

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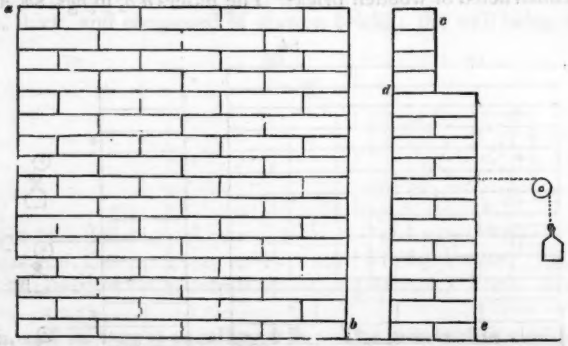

the weight on the top of structures of this kind, as explained by the table relating to *fig.* 66.

On farther reducing this wall in thickness four courses lower, or, altogether, eight courses, and applying the lateral force at the eighth course, as shown by the diagram *fig.* 86., the lateral force required to overturn this wall was $2\frac{5}{8}$ lb. ; but, when the wall was still farther reduced in thickness to within four courses

of the base, as shown by *fig.* 87., the lateral force required to overturn it was only 1 lb. In the former of these two experiments (*figs.* 86. and 87.), the wall gave way on the bottom course: and, in the latter, the wall broke on the base *d*, the force being applied at *f*. On constructing the same wall, as represented in the end view of *fig.* 87., but adding to it a pilaster

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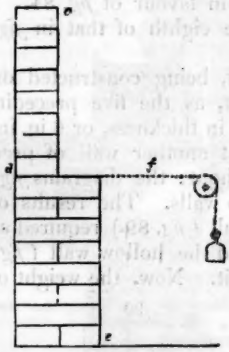

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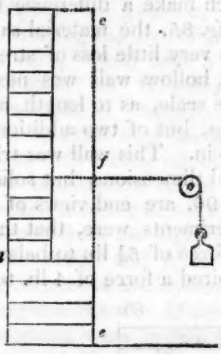

of 2 in. in width, placed on the base *d*, as shown by the dotted line in that diagram, the result was, that, when applying the lateral force at *f*, it required $2\frac{1}{8}$ lb. to balance it.

By increasing the pilaster to 4 in. in width, as shown by *g h*, *fig.* 88., and applying the force *f*, as before, $2\frac{1}{2}$ lb. were necessary to balance the wall.

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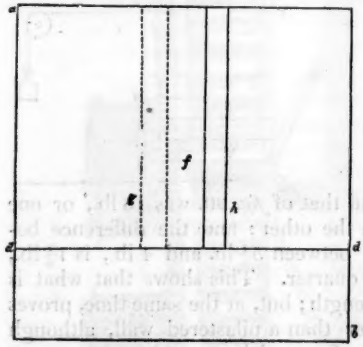

From these two experiments it appears, that pilasters, or flat buttresses, are of service in giving strength to a thin wall; but the plan will only answer where the force, as of the wind, can act on one side. The cause of the increased strength given to a wall by a pilaster is owing, in a great measure, to the centre of gravity of such wall being the farthest within the base, and having the base of the pilaster of the same depth (as in *fig.* 84.); but, it must be observed, that the lateral force is applied directly through the pilaster, and the force, as of the wind, would act on the whole length of the wall; therefore, in order to obtain the true value of the pilasters, the average lateral force must be

taken between walls without pilasters, and walls with them; which, in the above case, is $1\frac{3}{4}$ lb., being the average between 1 lb. and $2\frac{1}{2}$ lb.

The quantity of material composing the wall *fig.* 88. is about a quarter less than that of *fig.* 84.; and the difference in strength of the former to the latter is not quite half; the lateral resistance of *fig.* 84. being $2\frac{3}{8}$ lb., and that of *fig.* 88. being $1\frac{3}{4}$ lb.; which make a difference of $1\frac{1}{8}$ lb. in favour of *fig.* 84. Now, in *fig.* 85. the material saved is one eighth of that in *fig.* 84., with very little loss of strength.

A hollow wall was next erected, being constructed on the same scale, as to length and height, as the five preceding figures, but of two additional inches in thickness, or 6 in. instead of 4 in. This wall was tried against another wall of precisely equal dimensions, but solid throughout: the diagrams *figs.* 89. and 90. are end views of these two walls. The results of the experiments were, that the solid wall (*fig.* 89.) required a lateral force of $5\frac{1}{2}$ lb. to balance it; and the hollow wall (*fig.* 90.) required a force of 4 lb. to balance it. Now, the weight of the

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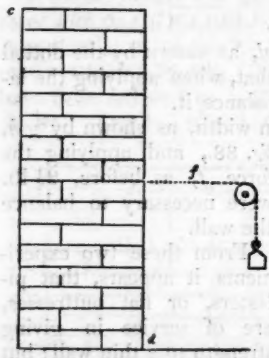

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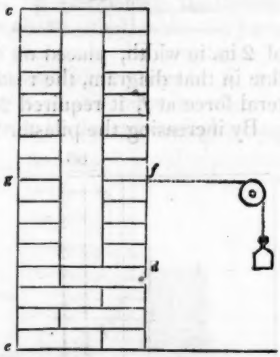
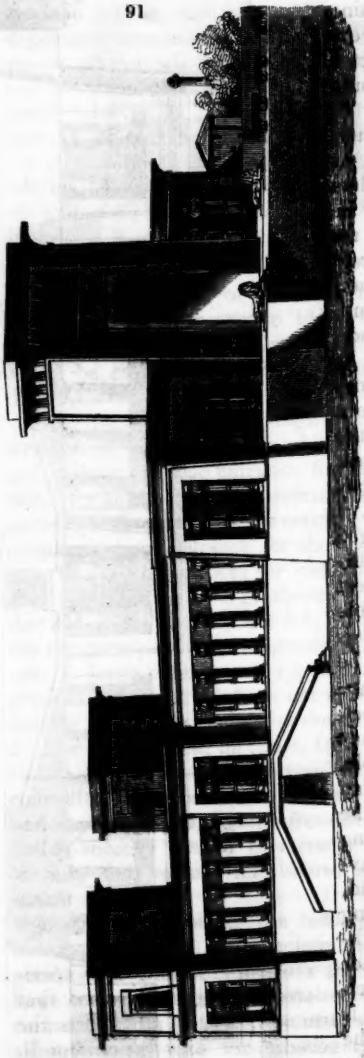


wall *fig.* 89. was 24 lb.; and that of *fig.* 90. was 18 lb., or one quarter less of material than the other; and the difference between the lateral force, or between $5\frac{1}{2}$ lb. and 4 lb., is $1\frac{1}{2}$ lb., which is rather more than a quarter. This shows that what is saved in material is lost in strength; but, at the same time, proves a hollow wall to be stronger than a pilastered wall, although containing the same quantity of materials.

Let it be here remarked, that, whilst carrying on the experiment with the hollow wall, the lateral force at *f* caused that part of the wall *g* to yield a little inwards; which shows the necessity of preventing this by occasionally introducing bonds. Both of these walls (*figs.* 89. and 90.) gave way towards the bottom courses.

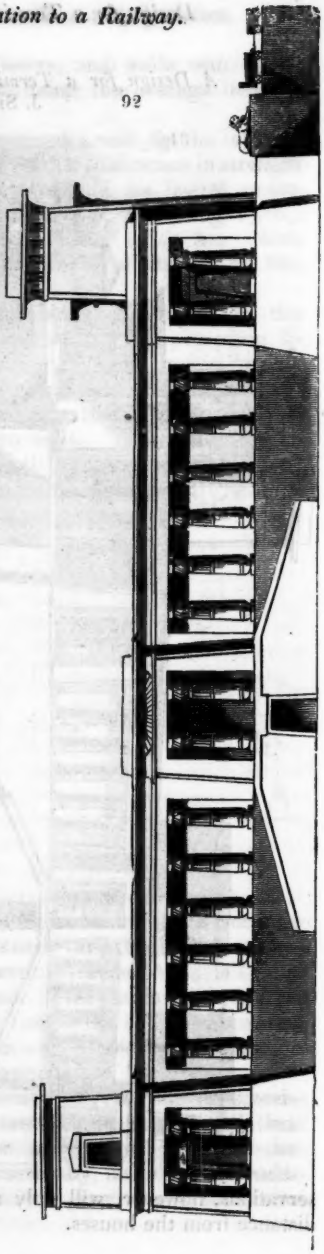
ART. V. *A Design for a Termination to a Railway.* By Mr. W. J. SHORT.

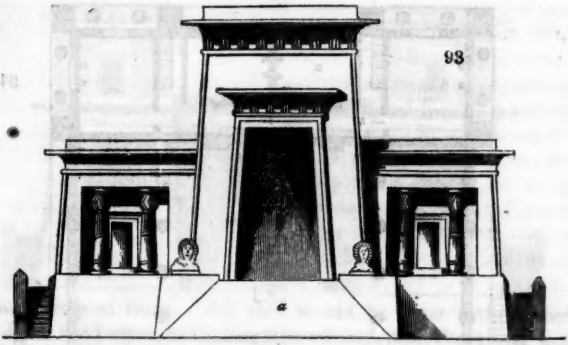


UNDERSTANDING that two or three lines of railroads have been advertised by different engineers from Brighton to London, and presuming that one of them, at least, would have a termination at Kennington Common, it occurred to me, on examining the spot, that, with a little attention, the termination might be made a pleasing object when viewed from the high turnpike road, and from the residences in the immediate neighbourhood. If the inhabitants were certain that it would be so (for many now picture to themselves high bare walls, similar to gas-works), a great deal of the opposition, which I am sure the promoters of these schemes will otherwise meet with, would vanish; as large public buildings, possessing architectural beauty, will always improve any neighbourhood, by introducing a taste for embellishment and alteration in the appearance of the surrounding houses, to meet and reduce as much as possible the contrast; and, when new buildings appear under such circumstances, they are generally of a much superior character to those which were previously in existence. These observations, however, will only apply when the railroad is some distance from the houses.

On the above considerations, I have taken this opportunity of putting forward the following sketch, without expecting that the plan will be found exactly to suit any of the projected roads, as no two railways would require the same quantity or description of buildings at their terminations; and fearing, as I have had no particular data to work upon, that it may be found defective in many respects. My intention is merely to show, in a rough manner, that, in all works of this kind, a certain degree of elegance, and even grandeur, may be obtained by a judicious employment of architecture, without injury to the purposes of the railway, and with no very great additional expense or trouble. In such important works, I hope it will be acknowledged by engineers, that, at the terminations in or near great towns, it would be desirable that the necessary buildings surrounding them should be well studied as to their appearance and general effect, so that, when completed, they might form an imposing whole.

I have chosen the Egyptian style, which is probably the most suitable for engineering purposes: being massive; having few and bold details; and, consequently, not requiring very nice or expensive workmanship or materials. Another advantage is, that not much knowledge of architecture is required to superintend the erection of works in this style, after drawings have been sup-

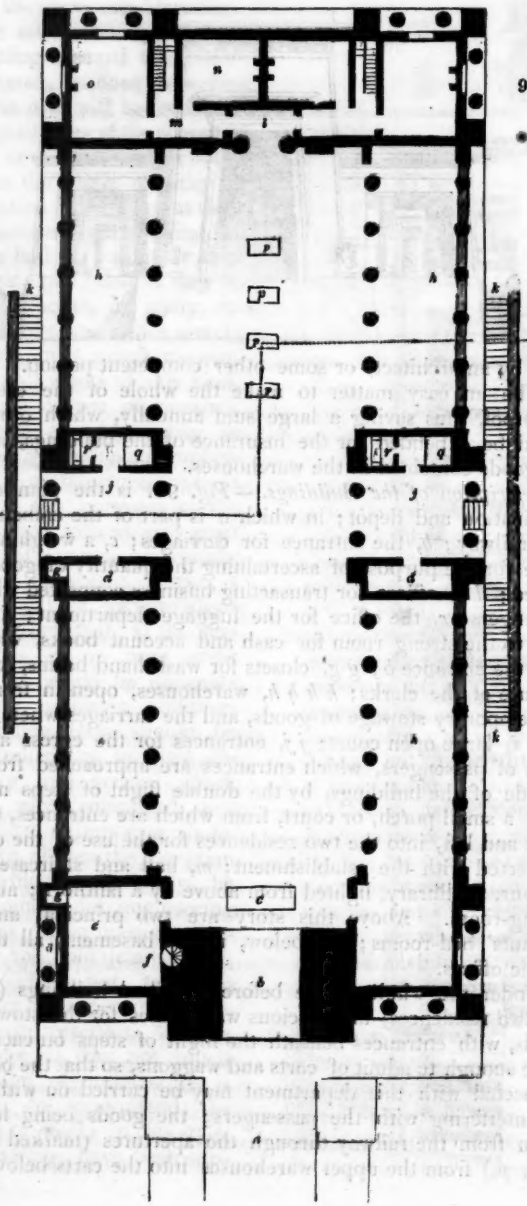




plied by an architect, or some other competent person. It will also be an easy matter to make the whole of the erections fire-proof, thus saving a large sum annually, which otherwise would be expended for the insurance of the buildings, and of the goods contained in the warehouses.

Description of the Buildings.—*Fig.* 94. is the plan of the termination and depôt; in which *a* is part of the embankment and railway; *b*, the entrance for carriages; *c*, a weighing machine for the purpose of ascertaining the quantity of goods imported; *d d*, offices for transacting business connected with the passengers; *e*, the office for the luggage department; *f*, staircase to the strong room for cash and account books, which is over the entrance *b*; *g g*, closets for wash-hand basins, &c., for the use of the clerks; *h h h h*, warehouses, open in front, for the temporary stowage of goods, and the carriages when not in use; *i*, large open court; *j j*, entrances for the egress and ingress of passengers, which entrances are approached from the outside of the buildings, by the double flight of steps marked *k*; *l*, a small porch, or court, from which are entrances, on the right and left, into the two residences for the use of the officers connected with the establishment; *m*, hall and staircase; *n*, a parlour, or library, lighted from above by a lanthorn; and *o*, a dining-room. Above this story are two principal and two servants' bed-rooms; and below, in the basement, all the domestic offices.

Under the whole of the before-described buildings (except the two residences) are spacious warehouses for the stowage of goods, with entrances beneath the flight of steps on each side, large enough to admit of carts and waggons, so that the business connected with this department may be carried on without at all interfering with the passengers; the goods being lowered down from the railway through the apertures (marked on the plan, *p*,) from the upper warehouses into the carts below to be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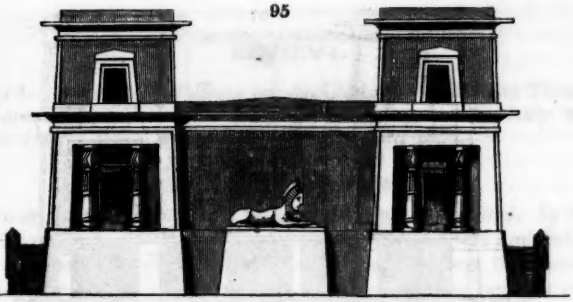

carried away at once. All this would be done without being seen from the houses in the neighbourhood, and, therefore, would not be an eyesore, nor any annoyance, to the occupants.

Here, also, might be the workshops for the occasional repair of the carriages, &c.; and places for keeping stores and materials for the repair of the railway, in the vicinity of its termination. In this case, it appears to me, that the best method to light the basement will be with gas; but windows in the sides, with the assistance of the openings (marked *p*) would, perhaps, be sufficient light for this story, if it should be thought preferable. *q q* are staircases from above; *r r* are water-closets.

Fig. 93. is the elevation next the railway, showing the entrance for carriages in the centre, with the strong room above, and the two offices forming the wings. *a* is a transverse section of the railway embankment.

Fig. 95. is the elevation of the two residences as seen from the outside of the buildings.

Fig. 92. is a side elevation. On the basement, in the centre, is the entrance to the warehouses for carts, &c.; in the right wing is one of the offices, and in the left wing, one of the residences; the intermediate space between the two being filled up with the passengers' entrance, the flight of steps, and the warehouses. *a* is the embankment and railway, with a carriage coming up.

I have shown the columns all of one pattern or design, although I do not see any objection to a little difference being made in the details, in order to give variety on near inspection; but care must be taken not to alter their general outline, so as to produce too strong a contrast when viewed from a moderate distance.

96 In effect in the interior court (*i*, *fig.* 94.) is not, in this case, of very great consequence, instead of the columns shown, square ones, like those in *fig.* 96., might be introduced without much impropriety; the form being simple, and expressive of strength, consequently in character with the style of the whole, and also less expensive. Nearly similar supports are to be found in the Temple of Keylas.

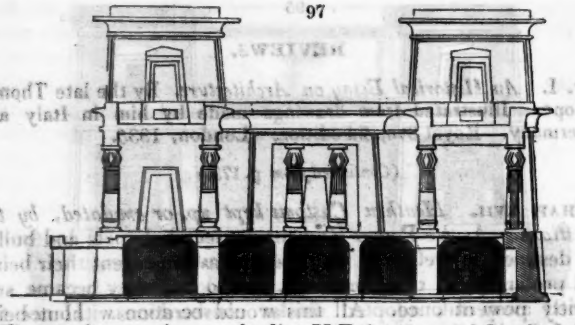

Fig. 97. is a section on the line Y Z, in *fig.* 94. On the left is one of the passengers' entrances, and on the right one of the open warehouses; at the end of the large open court is seen the porch, under which are the doorways to the residences on each side of the same; below are the arched warehouses with the entrance to them.

Fig. 91. Perspective view of the termination.

It will be well here to notice, that I have not provided any particular place for the departure of cattle, thinking that not many would be likely to come by a railway from Brighton; but, should it be thought necessary, it may be readily managed by leaving out the two parlours (*n*, *fig.* 94.), and making there an entrance to an easy inclined plane down to the common below. Above such entrance there could be erected two sitting-rooms to the residences, in lieu of those now shown; but a little alteration in the position of the doorways to the houses would, in that case, be required; or one of the passengers' entrances would do for the exit of live stock, having an inclined plane, instead of a flight of steps; although I think the best plan of all would be to land them on an inclined plane, by the side of the railway embankment, at some little distance from the front of the carriage entrance.

If it should be determined to make any architectural display at the terminations, or at other places, such as at viaducts, &c., on any railway, it would be an excellent plan to have one or two large well-executed drawings made of such objects, and have them exhibited in the neighbourhood where it may be intended to erect them; as, no doubt, many persons would, in such a case, view the matter more favourably than if they were kept quite in the dark; and, probably, some patrons might be found amongst them. The pictures would also be useful to exhibit before the committees of the Houses of Parliament, when applying for an act to authorise the construction of the works.

London, November, 1835.

REVIEWS.

ART. I. *An Historical Essay on Architecture.* By the late Thomas Hope. Illustrated from drawings made by him in Italy and Germany. Royal 8vo, 2d edition. London, 1835.

(*Continued from* p. 173.)

CHAP. XVII. *Heathen Customs kept up, or emulated, by the Christians.* As the Pagan Romans consecrated spots and buildings destined for religious purposes, so as to prevent their being used profanely, so the Christians, as soon as they became sufficiently powerful, adopted similar consecrations. Hence the origin of sprinkling with holy water, in imitation of the lustral water of the Pagans who preceded them.

"In idolatrous Rome, the priestesses of certain deities were obliged to make a vow of perpetual virginity; which custom, as soon as the Christians became sufficiently numerous to spare certain members from their further increase, they imitated in their religious orders, male and female. In truth, the very tunic of the priest, the lituus of the augur, and cap of the flamen of Pagan Rome, were preserved in the Dalmatic, the mitre, the staff, and the crosier of Christian bishops.

"More important similarities still crept in: for while the first Christians, chiefly composed of Jews and Gentiles, had, even in their state of comparative darkness, already discarded division or plurality in the Godhead, had already confined their worship to one single immaterial essence, we may say that the later Christians re-introduced, even in their purer religion, the shadow of polytheism, and the worship of many gods. Saints, nay, saintesses, were supposed, in their glorified state, to possess influence over men, and ability to intercede for them with the Deity, and a power of performing miracles; and soon obtained, not only reverence, but addresses, invocations, prayer, and worship.

"Indeed, the resemblance between Christians and polytheists even, in some respects, became more pointed. It is singular that the latter, of every denomination, seem alike to have distinguished and honoured some goddess for the preservation of her virginity. The Indians made it the peculiar attribute of one of their deities; the Asiatic Greeks, of Diana; the European Greeks, of Minerva; the Christians, who found it in the Mother of God, bestowed upon her a sort of apotheosis, for which the Scripture affords no foundation. Nay, they afterwards maintained that Mary's own conception offered the same miracles with that of her Son; and, in view of that circumstance, transferred to her, in their representations, the crescent, which had belonged to the Diana of the Greeks and the Isis of Egypt." (p. 187—189.)

From this chapter, and others in the work, it appears that religion, like every thing else human, commences in a state of rudeness, and barbarous simplicity and grossness; it afterwards becomes more complex, even to confusion, as in the case of polytheism; it next becomes comparatively simple, as in the case of Christianity; and the nature of its further progress may be anticipated from the past; the ultimate *beau idéal* seems to be purity and simplicity.

Chap. XVIII. *Schism between the Greek and Latin Churches,*

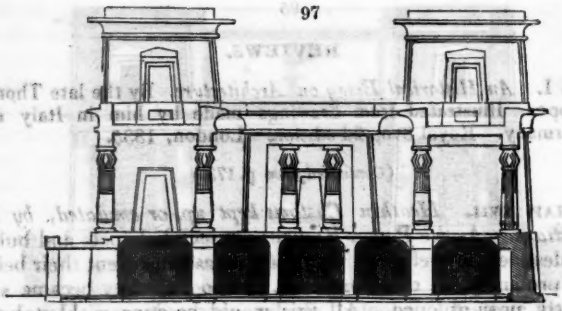

Fig. 97. is a section on the line Y Z, in *fig.* 94. On the left is one of the passengers' entrances, and on the right one of the open warehouses; at the end of the large open court is seen the porch, under which are the doorways to the residences on each side of the same; below are the arched warehouses with the entrance to them.

Fig. 91. Perspective view of the termination.

It will be well here to notice, that I have not provided any particular place for the departure of cattle, thinking that not many would be likely to come by a railway from Brighton; but, should it be thought necessary, it may be readily managed by leaving out the two parlours (*n*, *fig.* 94.), and making there an entrance to an easy inclined plane down to the common below. Above such entrance there could be erected two sitting-rooms to the residences, in lieu of those now shown; but a little alteration in the position of the doorways to the houses would, in that case, be required; or one of the passengers' entrances would do for the exit of live stock, having an inclined plane, instead of a flight of steps; although I think the best plan of all would be to land them on an inclined plane, by the side of the railway embankment, at some little distance from the front of the carriage entrance.

If it should be determined to make any architectural display at the terminations, or at other places, such as at viaducts, &c., on any railway, it would be an excellent plan to have one or two large well-executed drawings made of such objects, and have them exhibited in the neighbourhood where it may be intended to erect them; as, no doubt, many persons would, in such a case, view the matter more favourably than if they were kept quite in the dark; and, probably, some patrons might be found amongst them. The pictures would also be useful to exhibit before the committees of the Houses of Parliament, when applying for an act to authorise the construction of the works.

London, November, 1835.

REVIEWS.

Art. I. *An Historical Essay on Architecture.* By the late Thomas Hope. Illustrated from drawings made by him in Italy and Germany. Royal 8vo, 2d edition. London, 1835.

(*Continued from* p. 173.)

Chap. xvii. *Heathen Customs kept up, or emulated, by the Christians.* As the Pagan Romans consecrated spots and buildings destined for religious purposes, so as to prevent their being used profanely, so the Christians, as soon as they became sufficiently powerful, adopted similar consecrations. Hence the origin of sprinkling with holy water, in imitation of the lustral water of the Pagans who preceded them.

"In idolatrous Rome, the priestesses of certain deities were obliged to make a vow of perpetual virginity; which custom, as soon as the Christians became sufficiently numerous to spare certain members from their further increase, they imitated in their religious orders, male and female. In truth, the very tunic of the priest, the lituus of the augur, and cap of the flamen of Pagan Rome, were preserved in the Dalmatic, the mitre, the staff, and the crosier of Christian bishops.

"More important similarities still crept in: for while the first Christians, chiefly composed of Jews and Gentiles, had, even in their state of comparative darkness, already discarded division or plurality in the Godhead, had already confined their worship to one single immaterial essence, we may say that the later Christians re-introduced, even in their purer religion, the shadow of polytheism, and the worship of many gods. Saints, nay, saintesses, were supposed, in their glorified state, to possess influence over men, and ability to intercede for them with the Deity, and a power of performing miracles; and soon obtained, not only reverence, but addresses, invocations, prayer, and worship.

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Chap. xviii. *Schism between the Greek and Latin Churches,*

and its Effect upon the latter; the Multiplication of sculptured Representations. The first Christians being chiefly converted Jews, and observers of the laws of Moses, abhorred images; but afterwards, when Christianity spread among the idolaters, who were accustomed to have their devotion excited by visible objects, the saints, including our Saviour, the Virgin, and other personages, were sculptured or painted. This led ultimately to the separation of the Christians into two sects, the Greek church, which did not admit of images, and the Latin church, which required them.

(To be continued.)

ART. II. *The Laws of harmonious Colouring, adapted to interior Decorations, Manufactures, and other useful Purposes.* By D. R. Hay, House Painter, Edinburgh. 8vo, 3d edition, pp. 72, 5 coloured plates and several Diagrams. Edinburgh, 1836.

ONE of the characteristics of the present age is, the union of science and practice in our tradesmen and manufacturers. It is impossible to peruse the work before us, without being convinced that its author is thoroughly acquainted with the science of his art, and without being struck with his unassuming and modest manner of expressing himself. Independently of the subject on which the volume treats, there is much sound sense in it on the subject of art and artists generally; and, though it is impossible to do full justice to Mr. Hay's ideas without the aid of his coloured plates; we shall give a short outline of his system, and quote some of his remarks on artists, and on the application of art to manufactures.

In the two former editions of this work, the author tells us, that he "merely endeavoured to adapt the laws of harmonious colouring to interior decoration. In this edition, however, I have given such a general view of those laws as, I trust, may be useful in all cases where various colours are necessarily brought together; whether in decoration, manufacture, dress, planting of flowers, or in other ordinary matters. Independently of such applications, however, I do not hesitate to say, that a knowledge of these laws will enhance the pleasure derived from viewing the beauties, not only of pictorial art, but of Nature herself, in so far as that knowledge is calculated to cultivate and improve the perception.

"The error of considering the arrangement of colours as a matter of taste merely is very prevalent. Mere matters of taste, however, are subjects upon which both nations and individuals differ widely; and there are no productions of this kind, however extravagant or absurd, that have not their admirers while they bear the gloss of novelty or stamp of fashion. Such matters are subject to no rule whatsoever; they are governed entirely by caprice; but it is very different with the arranging of colours, for that is regulated by laws founded on natural principles. There are, no doubt, many varieties of tastes in regard to colours, both individually and arranged. Many have fancies for, and antipathies to, particular hues. All have their tastes in regard to particular styles of colouring; some being fond of gay and lively;

some, the rich and powerful; and others, the deep and grave. Some have a partiality for complex arrangements, while others prefer extreme simplicity. But this is the case in music also: every variety and style of composition has its particular admirers; yet it never is assumed from this, that the arranging of the notes in a melody, or other musical composition, is a mere matter of taste. All know that the arrangements of notes, in such cases, is regulated by fixed laws, which cannot be deviated from without giving offence to the ear; and that a knowledge of these laws is absolutely requisite to every one who wishes to cultivate that pleasing art. It does not matter under what circumstances a variety of colours is presented to the eye; if they be harmoniously arranged, the effect will be agreeable to that organ, as harmonious music to the ear; but, if not so arranged, the effect on the eye must be unpleasant; and the more cultivated the mind of the individual, the more annoying will such discordance be. These facts I have endeavoured to make apparent, by drawing an analogy between the science of colour and that of sound." (*Introd.*, vii.)

That the ancients understood the laws of harmonious colouring, or, perhaps rather, that they had a just feeling for it, Mr. Hay considers, is rendered evident by the paintings in Egyptian tombs, and in the remains of Pompeii and Herculaneum. From coloured sketches made on the spot, and from other sources, Mr. Hay is of opinion, that the knowledge of the Romans, at the time when the cities mentioned were in prosperity, must have been of the most scientific nature. We doubt this, because the Romans were not a scientific people; and we think the harmony of their colouring may be accounted for, from their artists being men whose genius for that department of art was such as to impel them to adopt it as a profession. Many of the greatest painters and sculptors of modern times, we are persuaded, know very little of the science of their art; but are, or have been, chiefly guided by their feelings, and by the keen sense, implanted in them by nature, of what is beautiful in combinations of colours and of forms. We offer this view of the subject, however, with due deference to the opinion of those who have paid more attention to it than ourselves, and more especially to Mr. Hay, who says:—

"Harmony of colouring is, at the present period, evidently becoming one of the characteristics of our national school of painting; and this will, no doubt, eventually lead to a knowledge of it amongst the more humble class of colourists to which I belong. Yet I consider it a necessary step towards the attainment of this knowledge, that the simple rules, or groundwork, of the art should be disseminated amongst us in a popular form. With these views, but confining myself to an application of those rules to my own humble profession, I published this little treatise. The success of the first and second editions, my experience since, and, above all, the study of Field's scientific and excellent works *On Chromatics*, have induced and enabled me, not only to remodel, and, I trust, greatly improve, the present edition, but to extend its usefulness, by adapting it to variously coloured manufactures; and, indeed, to every case where colours are brought together to produce effect. Harmonious arrangements of colours being such combinations as, by certain principles of our nature, produce an effect on the eye similar to that which is produced by harmonious music on the ear; and, as a remarkable conformity exists between the science of colour and that of sound, in their fundamental

principles, as well as in their effects, I shall probably best pave the way to a proper comprehension of the former by tracing this analogy; the more especially, as the science of music is so much more generally understood. This analogy will help to show, that the laws which govern colour are as irrefragable, and, at the same time, as practically necessary to the colourist, in art, manufacture, or decoration, as those which govern sound are to the musician." (p. 4.)

We pass over several experiments made by Mr. Hay, to satisfy himself that "there are only three primary homogeneous colours in nature," to the author's comparison of colours with musical sounds.

"It is well known to all who have studied music that there are three fundamental notes, viz. C, E, and G, which compose the common chord, or harmonic triad; and that they are the foundation of all harmony. So, also there are three fundamental colours; the lowest number capable of uniting in variety, harmony, or system. By the combination of any two of these primary colours, a secondary colour, of a distinct kind, is produced; and, as only one absolutely distinct denomination of colour can arise from a combination of the three primaries, the full number of really distinct colours is seven; corresponding to the seven notes in the complete scale of the musician. Each of these colours is capable of forming an archeus, or key, for an arrangement, to which all the other colours introduced must refer subordinately. This reference and subordination to one particular colour, as is the case in regard to the key-note in musical composition, gives a character to the whole. This characteristic of an arrangement of colour is generally called its tone; but it appears to me that this term is more applicable to individual hues, as it is in music to voices and instruments alone. Yet, to avoid obscurity, I shall continue to use it in the sense in which it is generally applied to colouring. From the three primary colours, as will be afterwards shown, arise an infinite variety of hues, tints, and shades; so that the colourist, like the musician, notwithstanding the extreme simplicity of the fundamental principles upon which his art is built, has ample scope for the production of originality and beauty in the various combinations and arrangements of his materials. The three homogeneous colours, yellow, red, and blue, have been proved by Field, in the most satisfactory manner, to be in numerical proportional power as follows: yellow, three; red, five; and blue, eight. When these three colours are reflected from any opaque body in these proportions, white is produced. They are then in active state; but each is neutralised by the relative effect that the others have upon it. When they are absorbed in the same proportions, they are in a passive state, and black is the result. When transmitted through any transparent body, the effect is the same; but, in the first case, they are material, or inherent; and, in the second, impalpable, or transient. Colour, therefore, depends entirely on the relative or refractive power of bodies, as the transmission or reflection of sound does upon the vibratory powers.

"From the combination of the primary colours, the secondary arise; and are, orange, which is composed of yellow and red, in proportion of 3 and 5; purple, which is composed of red and blue, in the proportion of 5 and 8; and green, composed of yellow and blue, in the proportion of 3 and 8. These are called the accidental, or contrasting, colours to the primaries; with which they produce harmony in opposition, in the same manner in which it is effected in music by accompaniment; the orange with the blue, the purple with the yellow, and the green with the red. They are, therefore, concords in the musical relation of fourths, neutralising each other at sixteen. This neutralising, or compensating, power, as will be afterwards shown, is the foundation of all agreement and harmony amongst colours; and upon it depend, also, the brilliancy and force of every composition. From the com-

bination of these secondaries arise the tertiaries, which are also three in number, as follows: olive, from the mixture of the purple and green; citron, from the mixture of the green and orange; and russet, from the mixture of the orange and purple. These three colours, however, like the compounds produced by their admixture, may be reckoned under the general denomination of neutral hues, as they are all formed by a mixture of the same ingredients; the three primaries, which always, less or more, neutralise each other in trinity. The most neutral of them all being grey, the mean between black and white, as any of the secondaries are between two of the primaries, it may appropriately be termed the seventh colour. These tertiaries, however, stand in the same relation to the secondaries that the secondaries do to the primaries; olive to orange, citron to purple, and russet to green; and their proportion will be found to be in the same accordance, and neutralising each other integrally as 32. Out of the tertiaries arise a series of other colours, such as brown, marone, slate, &c., in an incalculable gradation, until they arrive at a perfect neutrality in black, as shown in diagram 2. To all of these the same rules of contrast are equally applicable.

"Besides this relation of contrast in opposition, colours have a relation in series, which is their melody. This melody, or harmony of succession, is found in all the natural phenomena of colour. Each colour on the prismatic spectrum, and in the rainbow, is melodied by the two compounds which it forms with the other two primaries: for instance, the yellow is melodised by the orange on the one side, and by the green on the other; the blue, by the green and purple; and the red, by the purple and orange. Field, in his excellent *Essay on the Analogy and Harmony of Colours*, has shown these coincidences by a diagram, in which he has accommodated the chromatic scale of the colourist to the diatonic series of the musician, showing that the concords and discords are also singularly coincident."

We have now given as distinct an idea as we can of Mr. Hay's *Treatise*, without the aid of his coloured plates; and we have done so with a view of showing every young architect, builder, or other person connected with houses or furniture, how much they may gain from Mr. Hay's book. In short, there is no other such work on the subject of which it treats; and none of which it may be so truly said, that it ought to be in the hands of every one at all connected, however remotely, with building and furnishing.

We now proceed to the second part of our duty, that of quoting some of Mr. Hay's remarks on art and artists generally.

"It is remarkable, that, while we are so far behind our Continental neighbours in the application of the rules of art to our manufactures, the British school of painting should have risen so far above that of every other country in the world. And this is not all; for it must be evident to every one who may be in the habit of attending our annual exhibitions of modern pictures, that mediocrity of talent in the fine arts is multiplying beyond all probable means of employment. I have had a good deal of experience in matters of this kind, from having had, for upwards of twelve years, seldom less, at any time, than ten or twelve apprentices to instruct in ornamental painting. I trust it will not, therefore, be reckoned presumptuous in me giving an opinion in the matter.

"In the first place, I believe this want of ornamental designs, as Mr. Skene has distinctly stated in one part of his evidence, to arise as much from the nature of the instruction given, as from the want of opportunities afforded for study. It is seldom that the young men who are admitted to our drawing academies consider their studies as merely intended to improve them in

the useful arts to which they may be bred: they almost uniformly imbibe the idea of rising into a higher sphere; and seem to have no other ulterior object in their studies than to leave their humble calling at the expiration of their indenture, and become artists. I speak from particular facts which have come under my own observation. Many an industrious young man, of mediocre talents, but possessing sufficient to have raised him to the head of ornamental painting, have I known sacrifice himself to a life of penury and neglect from this vain idea. Various reasons may be assigned for the prevalence of this mania amongst young men who have had opportunities of studying the art of drawing: the flattery of their friends; injudicious patronage; the desire to become, by the quickest and easiest means, a gentleman; and various others, over which no national institution can have any control. The most prominent cause, however, seems to be, that nothing is reckoned a work of art unless it be a picture. No matter how superior an ornamental design may be, or how much study and knowledge may have been required to produce it, still the production of such, although it may increase the wealth of the individual, cannot raise him one step in the scale of society; he is only a mechanic in the eyes of the public. On the other hand, no sooner does the youth lay aside his useful implements, and dash off upon canvass something like a landscape (often with no eye to nature, but in servile imitation of some popular painting), than he seems to be, by common consent, raised to the dignity of an artist. In short, those branches of the fine arts that are applicable to the manufactures, and to other departments of useful industry, do not, in this country, hold that relative situation to the more intellectual and higher branches to which they are fairly entitled. This is not the case in Italy, as I am informed by an artist who has studied for several years in that country. He says that, in the Academy of the Fine Arts at Venice, there are distinct professors in the following departments of art: architecture, painting, sculpture, engraving, perspective, and ornament; and that in this latter branch the pupils are so numerous that, the professor requires an assistant. Their examples are not only the best ornamental models of antiquity, but fruit, flowers, and foliage. Every fifteen days they are required each to make an original design within a given number of hours (precautions being taken to prevent deception); and, according to its merits, advancement and preference are bestowed.

"Dr. Ure states that 'The town of Lyons is so conscious of the value of such studies, that it contributes 20,000 francs per annum to the government establishment of the School of Arts, which takes charge of every youth who shows an aptitude for drawing, or imitative design of any kind, applicable to manufactures. Hence all the eminent painters, sculptors, and even botanists and florists, of Lyons become eventually associated with the staple trade, and devote to it their happiest conceptions.' I feel quite assured that, were a similar course followed in our academies, a sufficient portion of that genius which at present seems to be all flowing into one channel, would, like a mill-lead [stream] taken from a river, be directed from that which is merely ornamental, to that which is essentially useful and beneficial to the country. Art would not suffer from this; on the contrary, where real genius was discovered, the facilities of encouraging it would be greater, and we should have less of that misapplied, and often selfish, sort of patronage, which fosters mediocre talent until it is factitiously raised to where it cannot stand, and is then, by the desertion of such injudicious patrons, allowed to fall far below its own natural level." (p. 61.)

Mr. Hay concludes his work with "A few Elementary Instructions in Ornamental Drawing, with Hints to the more advanced," which are admirably adapted for enabling any young mechanic to teach himself linear drawing, shading, and the simpler kinds of perspective. We repeat, that we cannot too strongly recommend Mr. Hay's work to our readers.

ART. III. *A Practical Treatise on Locomotive Engines upon Railways; a Work intended to show the Construction, the Mode of Acting, and the Effect of those Engines in conveying heavy Loads; to give the Means of ascertaining, on an Inspection of the Machine, the Velocity with which it will draw a given Load, and the Results it will produce under various Circumstances, and in different Localities; to determine the Quantity of Fuel and Water it will require; to fix the Proportions which ought to be adopted in the Construction of an Engine to make it answer any intended Purpose, &c.: with Practical Tables, giving at once the Results of the Formulæ; founded upon a great many new Experiments, made on a large Scale, in a daily Practice on the Liverpool and Manchester Railway, with many different Engines and considerable Trains of Carriages: to which is added an Appendix, showing the Expense of conveying Goods, by Locomotive Engines, on Railroads.* By the Chev. F. M. G. de Pambour, formerly a Student of the E'cole Polytechnique, late of the Royal Artillery, on the Staff in the French Service, Knight of the Royal Order of the Légion d'Honneur, &c., during a Residence in England for Scientific Purposes. 8vo. Weale, London, 1836.

THIS very excellent work appeared, in French, in the beginning of the year 1835; and the public are certainly much indebted to Mr. Weale for having produced it in a respectable English dress. We cannot give a better idea of the work, than by the following quotations from the Introduction:—

"There exists no special work on locomotive engines. Two writers, Wood and Tredgold, have, indeed, in England, slightly touched upon that matter, but only in a subordinate manner, in treatises on railways; and, besides, they both wrote at a time when the art was scarcely beyond its birth. Consequently their ideas, their calculations, and even the experiments they describe, have hardly any relation to the facts which actually pass before our eyes, and can be of no use to such as wish to acquire a knowledge of these engines, and their employ on railways.

"Many questions had not even been entered into, others had been solved in a faulty manner. New researches on the subject became, therefore, indispensable. This work will, in consequence, be found completely different from any thing that has been published hitherto. No facts will be quoted, but such as result from actual observation; no experiments related, but those made by the author himself, on a new plan, and with new aims; finally, no theory exposed, but such as is derived from those experiments.

"If at first sight it appear astonishing, that no theory of locomotive engines should exist, the surprise ceases on considering that the theory of the steam-engine itself, taken in general, has not yet been explained. It was natural to suppose, that, respecting a machine at present in such universal use, and on a subject of such importance, every thing had been said, and every explanation given, long ago. Far from this being the case, however, not even the mode of action of the steam in these engines has been elucidated. In the absence of such indispensable knowledge, all theoretical calculations were impossible. Suppositions were put in the place of facts. In consequence, we have seen very able mathematicians propose, on the motion of the piston in steam-engines, analytical formulæ, which would certainly be exact, if all things went on in the engine as they suppose; but which, not being founded on a true basis, fall naturally to the ground in presence of facts. From this also results

that, in practice, the proportions of the engines have only been determined by repeated trials, and that the art of constructing them has proceeded hitherto in the dark, and by imitation.

"Locomotive engines being first of all steam-engines, we cannot advance in the researches we undertake, without solving, at the same time, the question relating to steam-engines in general. There is even a remarkable point to be observed, which is, that of all sorts of steam-engines, locomotive ones are those which, in their application, have to overcome the least complicated resistance, and are most susceptible of a rigorous appreciation. This circumstance renders them, therefore, more proper than any others for furnishing an explanation of general facts common to all those machines. The theory once satisfactorily established in regard to locomotive engines will, of course, apply equally to all sorts of steam-engines, and more especially to those which, like locomotive ones, work at a high pressure.

"We flatter ourselves, therefore, that our researches, although apparently confined to locomotive engines, may, at the same time, illustrate the principal points of the theory of steam-engines in general.

"All the experiments related in the work were made by *ourselves*, with all the care and attention they required. Some were made in company with engineers of known talent and ability, as Mr. J. Loke of the Grand Junction Railway, and Mr. King of the Liverpool Gas-Works. We give them in all their details, with a view that every one may judge of their accuracy; and we mention the place and date of each experiment, in order to facilitate their verification by referring to the books, on which is registered the weight of each of the trains.

"In regard to the facility we had of making these numerous experiments, we must say that, having applied to the heads of the most imporant undertakings of the sort in England, we were permitted, without restriction, to penetrate into the workshops, to take every measure, to collect all the documents concerning the expenses, and, lastly, to make any experiment that appeared necessary to us.

"It is with pleasure we acknowledge in the English character the liberality we have found in the whole course of our investigations.

"We have studied the subject with all the interest, and, we might say, with all the enthusiasm, it excited in us. In fact, what a subject for admiration is such a triumph of human intelligence! What an imposing sight is a locomotive engine, moving without effort, with a train of forty or fifty loaded carriages, each weighing more than ten thousand pounds! What are henceforth the heaviest loads, with machines able to move such enormous weights? What are distances with motors which daily travel thirty miles in an hour and a half? The ground disappears, in a manner, under your eyes; trees, houses, hills, are carried away from you with the rapidity of an arrow; and, when you happen to cross another train travelling with the same velocity, it seems in one and the same moment to dawn, to approach, and to touch you; and scarcely have you seen it with dismay pass before your eyes, when already it is again become like a speck disappearing at the horizon.

"On the other hand, how encouraging is the evident prosperity of these fine establishments! How satisfactory it is to acquire the proof that the Liverpool railway produces 9 per cent interest, and the Darlington one an equal profit! With what confidence must we not anticipate the future state of such undertakings, when we know that, besides the above mentioned annual interest, the shares of the Liverpool Railway have risen, in four years, from 100*l.* to 210*l.*; and those of the Darlington Railway, in eight years, from 100*l.* to 300*l.*? What may not society at large expect in future from this new industry, which will augment ten-fold the capital and produce of the country, by the immense influence of speedy and economical conveyance!

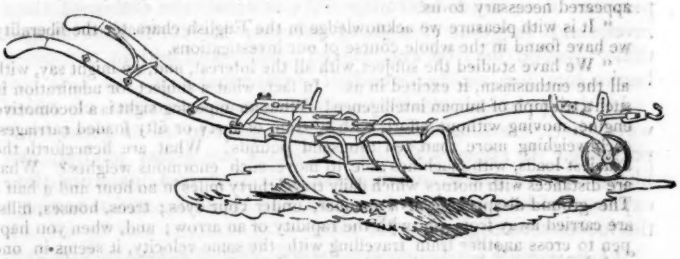
The work is divided into nine chapters, as follows: I. Description of a Locomotive Engine. II. On the Pressure in

Steam-Engines. III. On the Friction of Railway Carriages. IV. On the Friction, or Resistance, of Locomotive Engines. V. General Theory of the Motion of Locomotive Engines. VI. On some accessory Dispositions, and their Effect. VII. Of the Curves and Inclined Planes. VIII. Of the Adhesion. IX. Of the Fuel. An Appendix treats of the Haulage by Locomotive Engines on Railways.

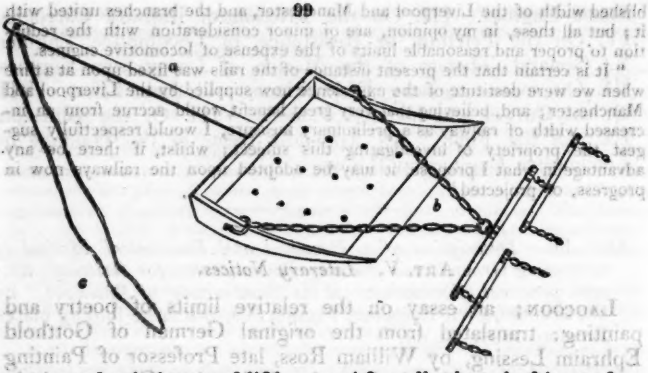
ART. IV. *Description of a Practical and Economical Method of excavating Ground, and forming Embankments for Railways, &c.; with practical Observations on the Construction of Railways.* By W. Brunton, Civil Engineer. Pamph. 8vo, two large folding plates. London, 1836. 2*s.* 6*d.*

THE object of this pamphlet is to explain the construction, and point out the use, of an apparatus for excavating ground, for which the author has obtained a patent. In making alterations on the surface of ground for agricultural and landscape-gardening purposes, a very considerable saving, where there is a great deal of work to be done, is sometimes effected by the alternate use of an implement like Finlayson's harrow (*fig.* 98.) and one like the land-leveller (*fig.* 99.)

98



This last machine has been a good deal used in Scotland by farmers for levelling down high ridges and other inequalities in fields; and, though we do not think it adapted for engineering purposes, yet there is a kind of lifting cart, for which a patent was taken out, some years ago, which might be substituted. This cart, or some modification of the dredging machine, might follow a stirring instrument. Both these machines might be moved by horses, or a stationary steam-engine; and both, we think, would have these advantages, that they would neither be costly at first, nor be apt to be put out of repair by the occurrence of large stones in the soil. The effect produced would be like the Indian mode of ploughing, by repeated scratching,



by repeated stirrings and liftings. After all, though this mode effects a great saving of labour in agriculture and landscape-gardening, we question whether much would be gained by it in engineering.

Mr. Brunton's machine appears to be constructed with a view to operating on the same principle as the two implements mentioned; viz. first stirring the soil, and then lifting it and carrying it away; but, whether it would ultimately prove economical or not, all circumstances taken into consideration, experience alone must determine. As is usual, the author of the invention is sanguine enough of success; his conclusion being, that "ground may be cut, moved a mile, and laid in the embankments, for less than one half of the usual cost." (p. 19.)

In the practical observations on the construction of railways, there are some remarks which appear to us of great importance. It appears that few railways are either paying, or likely to pay; not so much from their first cost, as from the expenses of keeping them in repair, and repairing and renewing the locomotive engines. He says, —

"I have narrowly watched the expedients resorted to, and also their effects; and, having extensive experience in the application of heat to generate steam, I feel confident that the cause of the expense in the repairs of locomotive engines is the intensity of the heat now applied to the boilers, the consequent deterioration of the tenacity of the parts exposed to its action, and the expansion and contraction of parts so contiguous as to occasion fracture; nor do I imagine that any practical engineer will call this in question. But how is it to be obviated? I answer, by increasing the area of the fire, reducing its intensity, and more uniformly applying the heat to the boiler. But this is next to impossible where the rails are only 4 ft. 8 in. asunder, as upon the Liverpool and Manchester railway; and, until we have a wider base on which to carry locomotive boilers, their destruction, and the cost of repairs, in my opinion, will continue to be an alarming item of expense.

"I am fully aware of the increased cost attendant on such a measure, and also of the practical objections which may be urged against a wide railway; nor do I overlook the inconvenience connected with departing from the esta-

blished width of the Liverpool and Manchester, and the branches united with it; but all these, in my opinion, are of minor consideration with the reduction to proper and reasonable limits of the expense of locomotive engines.

"It is certain that the present distance of the rails was fixed upon at a time when we were destitute of the experience now supplied by the Liverpool and Manchester; and, believing that very great benefit would accrue from an increased width of railway as a preliminary measure, I would respectfully suggest the propriety of investigating this subject; whilst, if there be any advantage in what I propose, it may be adopted upon the railways now in progress, or projected."

ART. V. *Literary Notices.*

LAOCOON; an essay on the relative limits of poetry and painting: translated from the original German of Gotthold Ephraim Lessing, by William Ross, late Professor of Painting and Sculpture in the Andersonian University, Glasgow; is in the press, and shortly will be published. This work is to be published by subscription, for the following reasons, which are given by the author in his prospectus. "The Laocoon of Lessing being a work of distinguished and acknowledged merit, it is somewhat surprising, that, with the exception of a few extracts given some years ago in a popular periodical, no part of it should have yet appeared in an English dress. But publishers say that the subject is one in which general readers do not take much interest; that, though there is a class to whom such a work would be very acceptable, it can only be made known to that class by being very extensively advertised; and that thus an expense would be incurred, which it is not probable the limited sales could defray. Believing, however, that the merits of the work cannot fail to recommend it to many readers, the translator is desirous of offering to the public a complete English version, the execution of which has occupied a part of his leisure hours; and, wishing to secure himself against the risk of loss (though gain is not his object), he has adopted the plan of publishing it by subscription." There is a very respectable list of subscribers appended.

MISCELLANEOUS INTELLIGENCE.

ART. I. *Foreign Notices.*

FRANCE.

A New Building for the Royal Library. — M. Ben. Delessert, one of the members of the Chamber of Deputies, has printed and distributed a *Mémoire sur la Bibliothèque Royale*, illustrated by two large folding plates, of which work a very interesting account is given in the *Literary Gazette* for April 9. We intend, if possible, to procure a copy of the work; but, in the meantime,

we give the following extracts from the *Literary Gazette*, because we think they contain some excellent hints on the general principles of designing libraries, museums, &c., and even booksellers' shops: —

"The advantages of a circular building for a library are," says the author, "that less space will be required, and that the books will be more accessible. The librarians and the readers will be placed in the centre of a vast rotunda, upon which eight grand galleries will abut. These galleries will be formed by walls disposed in diverging radii; and on the two sides of the walls will be placed the main body of the library. As this arrangement admits of the use of both sides of the walls, there will be room for double the number of books, which will be near the centre of the room, and can be easily procured; the keeper of the library, also, being installed in the middle of the rotunda, will have a view of all the galleries, and of all the persons in the room. This circular form will hold 800,000 volumes in a space of 1900 *toises carrées*, or 11,400 square feet. The building will also be incombustible; stone, marble, iron, pottery, and zinc being the only materials employed; the edifice to be warmed by steam, brought from an isolated building. Each room will be divided in its height by four iron galleries. The bookcases to be glazed, and not more than 6 French feet in height: so that there will be no occasion for movable ladders, or steps. Access to the galleries will be obtained by spiral iron staircases, placed behind the columns of the rotunda. All the books will be preserved from dust, and under lock and key; and the total expense of this vast library will be 8,000,000 of francs, or about 320,000*l*. But it will not cost the government anything; because the buildings at present occupied by the Royal Library, in the Rue Vivienne, the Rue Richelieu, and the Rue Neuve des Petits Champs, have been valued at the same sum, and might be sold to defray the expense of the new building."

M. Delessert does not seem disposed to admit the last official account of the number of volumes in the Royal Library, viz. 700,000 printed books, and 80,000 MSS.; but reduces the quantity to 600,000, and allows for additions to the library of 12,000 volumes a year. He does not place his books in double rows, but finds space for 800,000 volumes without resorting to this measure. The books to be arranged in the following eight grand divisions: — Theology, Jurisprudence, Government, Commerce and Finance, Natural History, the Sciences and Arts, General Literature, History and Voyages and Travels: these divisions to be contained in the eight galleries, which will be subdivided into 56 equal parts. "This immense collection of books," says M. Delessert, "will be placed in proximity with the readers, for it will not be necessary to traverse more than 120 ft. to procure any book; whereas, in square buildings with transverse galleries, this distance is often increased, allowing for going and returning, to 2700 ft., or nearly a quarter of a league; so that nothing short of a railroad would enable the attendants to bring the books to the readers in any reasonable time. The whole building may be completed in three years. As to the exterior decoration of this new library, and its union with the Louvre and the lateral galleries, whether by a portico, or a winter promenade, or a transverse gallery, it is not necessary for me to speak. Should this plan of a circular library be adopted, the Carousel will become one of the most magnificent squares in Europe; the Louvre situated at one extremity, the library in the centre, and the palace of the Tuileries, the obelisk of Luxor, and the two triumphal arches, on the same line, will present an assemblage of fine objects, scarcely to be equalled in any part of the world." A commission has been appointed to enquire into the practicability of M. Delessert's plan, and sanguine hopes are entertained of its adoption by the government. This interesting *brochure* is illustrated by two large folding plates, which convey a very clear idea of the possibility of erecting the edifice in question, and of completely adapting it to the purposes for which it was designed. (*Literary Gazette*, April 9.)

The Municipal Council of Paris has appropriated 5,500,000 francs to be expended this year in architectural improvements. When once Lon-

don is governed, as a whole, by a council, as we have long ago suggested in the *Gardener's Magazine*, when speaking on the subject of sewerage, and as has lately been ably treated in the *London and Westminster Review*, we, also, shall have annual grants for similar purposes; and something like unity of system will be followed in our public improvements.

Art. II. *Domestic Notices.*

ENGLAND.

Kent.—Architectural Improvement at Gravesend.—You cannot walk a dozen yards in Gravesend without stumbling over bricks and mortar; and such is the present rage for building in this town, that there are no less than seven architects who are known to be employed here at this time. Mr. Wilde from Brighton is engaged at the new baths; Mr. Mee has just finished a new Proprietary School; Mr. Decimus Burton has prepared a plan for laying out a large plot of ground in the high road, adjoining the chapel, for building; Mr Lamb is drawing to a conclusion with the Tivoli Tavern; Mr. Jenkins has just compieted some houses in the road for the Building Company; Mr. Shepperd has marked out the roads on the Windmill Hill preparatory to building; and Mr. Tierney Clarke, I believe, is employed at the Terrace Gardens. With so much professional assistance, Gravesend, I should think, will assume a very different, and much improved, appearance in a short time. The public baths are to be in the Moorish style of architecture, and the works are proceeding very rapidly. The Tivoli Tavern is in the Italian style, and, I understand is to be completed before April. It is a large building, situated in a very eligible spot; and, as it possesses every convenience for an extensive business, I have no doubt, from its elevated site, which commands such beautiful views, varied by land, wood, and water, and its possessing so many pleasant sitting-rooms, it will become very attractive. The Proprietary School, designed by Mr. Mee, is a very excellent composition in the Elizabethan style, and is a great ornament to the town. Every taste may now be satisfied; for we have not only the architects before mentioned, with all their profound study and experience, but amateurs innumerable; so that, if there is no great unity to be found in our elevations, there is the other essential quality, variety. We have, on one side, a grand house, decorated with columns and pilasters, enriched with capitals, cornices, and pediments, containing every accommodation for a large and wealthy family, well calculated to display the luxuriant taste of the proprietor; and adjoining to it is placed a modest, unassuming, plain brick dwelling, displaying the equally unassuming taste of its quiet proprietor, whose greatest ambition is just to keep his parapet half as high as that of his magnificent neighbour. This is the state of the building mania at Gravesend; and long may it continue to flourish! As I take some interest in architecture, and have just as much knowledge as will keep me from building without professional advice, I walk round to view the growth of these prodigies, and meet every where with the works of more architects. At Northfleet, Mr. Kendall is preparing for extensive improvements; and his embankment will be an excellent work: it is faced with Maidstone rag-stone built in cement. This improvement is in a very forward state, as are, also, the stairs for the landing-place. As I walked a little farther, I stumbled over more bricks and mortar: a cottage, at Northfleet, on Mr. Hyatt's estate, appeared to me evidently designed by an architect; and, upon enquiry, I found it was by Mr. Lamb. There is also a barn here, built something out of the ordinary way; but I should think Mr. Lamb had nothing to do with this. I continued my walk now along the high road; and, as I advanced, more new buildings presented themselves to my view, in various styles, each possessing merit in some point or other. Those built by Messrs. Francis and White, at Swanscombe, are well calculated to display their cement. Near this, on the London road, is a Gothic lodge, built with

square stone and cut flint, possessing considerable novelty in its design, and forming a very pleasing effect in the road: this, I understand, is also Mr. Lamb's production. From this lodge I turned into the field opposite to Ingress Park, where Mr. Alderman Harmer has been building a splendid mansion: it is entirely of stone, and is in the Gothic style. After walking round the beautiful park, and admiring the building from various situations, I entered the quiet, clean, and pleasant village of Greenhithe, and ascertained that Mr. Moring is Mr. Harmer's architect. I just refreshed myself after my ramble, and retraced my steps to Northfleet; when, instead of returning by the water side, I took the high road, just to look at some of the buildings erecting in that situation. There are several pleasant villas; but I could not ascertain that any architect has been employed on them, till I came to the new parsonage near the fine old church at Northfleet. The parsonage is designed by Mr. Griffiths in the Gothic style, and built with brick and stone dressings. I returned to Gravesend, and could not help reflecting upon the great difference in the habits of the London citizens, which, in a very few years, has caused so great a demand for these comfortable and elegant moderate-sized residences, to which the man of business of the present day may retire, and have the benefit of a healthy spot for his family; while, by the convenient and cheap mode of travelling afforded by the steam-boats, he is enabled to enjoy his social circle amidst the greatest blessings nature can bestow, an open country and free air. More landing-places are talked of for the steam-boats to come to: there are already three at Gravesend, and one at Northfleet; and others talked of there, and at Greenhithe. The principal pier at Gravesend was designed by Mr. Tierney Clarke; Mr. Kendall has made a design for a new one at Northfleet; and Mr. Lamb has designed one for Greenhithe. The distance from Gravesend to Greenhithe is about four miles; and in that short space there are no less than ten architects engaged, all of whom have been employed within the last two or three years, besides amateurs. At some future time, I will enumerate all the principal new buildings; but now I must cease, as I fear I have already occupied too much of your valuable time; and, if these communications will be of the least service for your excellent Magazine, I shall feel happy in contributing my little aid to the common stock. — *An Amateur. Gravesend, Feb.* 29. 1836.

Art. III. *Queries and Answers.*

Window Sashes shaking by the Wind. — Your correspondent, A. W. S., at p. 96., has quite mistaken the reason of sashes shaking, as also the cure. He says, "The only effectual remedy I know is, to have the window-frames made of well-seasoned timber; because it is the shrinking of the sash which gives it room to play backwards and forwards in the groove in which it runs." Any person conversant with the construction of sashes will know that the shrinking of the timber can have no effect upon the sash, in giving it more room between the beads; because, if it were all made of perfectly green timber, the sash-frame, or pulley-style, would shrink in the same proportion as the sashes; and it is quite impossible to make them fit so full between the beads, when new, as not to shake, without causing the much greater evil of having them entirely fast after a coat or two of paint is given to them.

I have frequently entirely secured sashes from shaking by having the meeting-rails of sashes planed a little hollow on the sides where they meet together; and dressing off so much, that, when they are pressed together in the centre by a good sash-fastener, such as are commonly used, the sash-fastener, if properly set on, will cause both sheets to press firmly against the the parting bead; and this will completely prevent any shake in the sashes, provided they are properly managed by the joiner, who may still allow them

sufficient play to move freely when the sash-fastener is loosed. In some windows it will be necessary to remove the top and bottom inner beads, and fix them closer to the sashes than the side beads, to prevent the top and bottom parts from shaking, as well as the centre; and these, if constructed a little on the bevel on the sides next to the sashes, will act in a similar manner to wedges, when the sashes are shut home, and will not prevent them from sliding freely.

As I have been much benefited by reading communications from others in your Magazine, I consider myself under some obligation to give any information I am capable of in return; and shall be glad if this communication be found of any service to those labouring under the inconvenience complained of. — *Wm. Metcalf, Builder. Bradford, Yorkshire, Feb.* 29. 1836.

The best Practical Treatise on Road-making. — Can any of your correspondents tell me which is the best? — *W. K. Kineton, Warwickshire, March* 6. 1836. [Sir Henry Parnell's *Treatise on Road-making*, 1 vol. 8vo, mentioned in Vol. I. p. 94., and published in 1832, we believe to be the best work on the subject of roads extant. — *Cond.*]

Art. IV. *Institute of British Architects.*

March 28. 1836. — J. B. Papworth, V. P., in the Chair. The minutes of the last Meeting were read. The balance in the treasurer's hands appeared to be 239*l.* 19*s.* 5*d.* The following gentlemen were nominated, or elected: — *As Honorary Member:* The Ven. Robert Hurrell Froude, Archdeacon of Totness, Devonshire, was declared duly elected. *As Fellow:* Anthony Salvin, Architect, Somerset Street, Portman Square, was put in nomination.

The secretary announced that the following donations had been received since the last Meeting: — Mr. Martin, Hollar's View of Ancient London; Messrs. Freeman, specimens of stone, and a print of the roof of Westminster Hall; B. Ferry, Esq., large paper copy of his work *On Christ Church, Hants.*, 4to; Messrs. Ackermann, *Pugin's Designs for Iron and Brass Work*, 4to; J. Brunel, Esq., 12 copies of the elevation of an experimental arch; Society of Arts, 2 parts (1 vol.) of *Transactions for the Years* 1833–4, and 1834–5, 8vo; P. F. Robinson, V. P., 13 Gothic casts from York (St. Mary's Abbey); H. E. Kendall, Jun., Associate, 2 copies of Perspective View of proposed Greenwich Pier; T. L. Donaldson, Hon. Secretary, copy of his work *On Modern Doorways*, 4to. Resolved, that the acknowledgments of the Institute are due to the gentlemen above named, for their several contributions. Resolved, that the subjects for the Honorary Premiums shall be those approved and recommended by the Council. (See p. 185.)

The Council having recommended that a committee be formed for investigating Mr. Bernhardt's plan for Warming and Ventilating Buildings, &c., and that Dr. Faraday, Dr. Turner, Messrs. Brande and Hiort, and other scientific gentlemen, be invited to cooperate in the investigations: Resolved, that the above recommendation is approved and confirmed, and that the following Fellows be members of the said Committee, with such others as may be disposed to add their names, so that the whole number of Fellows do not exceed ten: — Messrs. Papworth, Robinson, Barry, Kendall, Rhodes, Inman, Scoles, Thomson.

Charles Fox, Esq., Engineer, then read a paper upon the construction of Skew Arches, with explanatory drawings and models. [This paper appeared in the *Phil. Mag.* for April; and the proprietors of that work, and Mr. Fox, have kindly permitted us to republish it in the *Architectural Magazine*, where it will appear in June next.] Resolved, that the cordial thanks of the Meeting be presented to Mr. Fox, for his able and lucid developement of the subject.

Mr. Goldicutt, Hon. Secretary, read a paper upon Ancient Wells, and their decorative character. Resolved, that the acknowledgments of this Institute are due to Mr. Goldicutt, for his interesting essay and illustrations.

April 11.— P. F. Robinson, V.P., in the Chair. The minutes of the last Meeting were read. The balance in the treasurer's hands appeared to be 209*l.* 19*s.* 11*d.* The following gentlemen were balloted for, and declared duly elected:— *As Fellow:* John Shaw, Architect, Christ's Hospital. *As Associate:* Harvey Eginton, Architect, Worcester. Sir Walter R. Farquhar was elected as Treasurer, to fill the vacancy caused by the death of his father, the late Sir Thomas Farquhar. The following members were elected as auditors, pursuant to Section X., to examine the balance sheet, which is to be laid before the Annual General Meeting in May next: Thomas Cundy, Fellow; and Charles Edward Lang, Associate.

The secretary announced that the following donations had been received since the last Meeting:— C. W. Dilke, Esq., *Le Fabbriche di Palladio*, 4 vols. small 4to, plates; Owen Jones, Esq., No. 1. of his work *On the Alhambra*, printed in colours and with gold; *Frazer's Literary Chronicle*, part iv., from the editor; Thomas Hamilton, Fellow, of Edinburgh, drawings of the temporary room erected for the Grey dinner, and plan and section of Dr. Reid's Class Room, Edinburgh.

The following letters were read:— One from M. Hebeler, sent by desire of M. Beuth, His Prussian Majesty's Privy Councillor, and Director of the different Institutes for Arts and Sciences. This distinguished gentleman proposes to transmit, as soon as possible, copies of all the works which have been published in Prussia under his superintendence, accompanied by a full explanation of the Rules, &c., of the Institute for Architects in his country; in offering which he is desirous to testify the high regard entertained by him for the British Institute, in addition to his best wishes for its prosperity, from the great benefit it will be of to the architectural science in this country. The other letter was from M. Hittorf, who, after thanking the Society for electing him an Honorary and Corresponding Member, apologises for not having written to them sooner; adding, that the reason of his delay "was the desire of presenting, at the same time, to my esteemed colleagues, the work upon the *Modern Architecture of Sicily*, which I have just completed, and to which I add two other publications, for which I would solicit a place in the library that you have lately formed. One of these works is my *Translation of the Unedited Antiquities of Attica*; and the other contains the *Description and Representation of a Ceremony celebrated at Paris in* 1820; a ceremony that I conducted with the assistance of my friend Mons. Le Cointe, a highly distinguished artist, whom I should see with pleasure enrolled on the list of the Foreign Members of your Institute, as being one amongst the architects of our capital, who may be deemed worthy of such an honour." In conclusion, M. Hittorf observes: "It would afford me extreme satisfaction to know that my labours have been examined by the Members of the Institute, and to be thoroughly acquainted with the strictures to which they may have given rise. I should thus be enabled to profit by the erudition of highly distinguished men, in the other publications in which I am at present engaged."

Mr. W. Turner then read a preliminary discourse, as introductory to his series of Lectures on Geology.

The papers presented by George Gutch, Fellow, on Monday, 15th Feb., containing an account of the drawings and books of Sir C. Wren, Inigo Jones, and James Gibbs, Architects, preserved in the Radcliffe Library at Oxford, were read.

The Academy of Parma have elected Sir John Soane and W. Wyon, Esq., Honorary Members of their body, and T. L. Donaldson, Esq., Honorary Associate; the Academy of Vienna have also elected Sir John Soane and W. Wyon, Esq., Members; in consequence of the bronze impressions of the Soanean medal sent to these academies.